MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN

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CEPHALOMETRIC ANALYSIS OF REPRESENTATIVES OF THE UZBEK POPULATION

(MONOGRAPH)

Tashkent – 2024

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The monograph is based on the analysis of its own research results, the cephalometric method of measuring the structure of the face and bite has been studied.

The monograph is intended for dentists and specialists dealing with this problem, as well as for orthodontists.

Introduction

Currently, despite the introduction of modern methods of diagnosis and treatment of congenital anomalies and deformities of the maxillofacial region into practical medicine, these disorders not only affect the patient's behavior, aesthetics of appearance, but also cause shifts in the neuropsychic status and lead to the development of diseases of the digestive system. According to WHO, anomalies of the maxillofacial region in the USA occur in 65% of cases, in European countries - 59.4%, in various regions of Russia they occur with a frequency of 30.9 to 76.5%, and in Uzbekistan they are observed in 62%. An urgent problem of modern dentistry is the improvement of methods for the diagnosis and treatment of anomalies and deformations of the maxillofacial region, as well as the study of anthropometric and cephalometric parameters of various ethnic groups of the population.

За годы независимости в нашей республике сфера здравоохранения претерпела значительные изменения. Внедрение в практическую медицину ранней диагностики и лечения врожденных и приобретенных аномалий челютно-лицевой области привело к улучшению среди различных групп населения внешности лица, уменьшению заболеваний дыхательной, пищеварительной и нервно-психической системы. В результате проведенных широкомасштабных мероприятий по изучению патогенеза, внедрения в практическую деятельность методов ранней диагностики и разработки современных методов лечения аномалий и деформаций челюстно-лицевой области, частота осложнений вследствие данного заболевани Over the years of independence, the healthcare sector in our republic has undergone significant changes. The introduction of early diagnosis and treatment of congenital and acquired abnormalities of the chelutofacial region into practical medicine has led to an improvement in facial appearance among various population groups, a decrease in diseases of the respiratory, digestive and neuropsychiatric systems. As a result of the large-scale activities carried out to study the pathogenesis, the introduction of early diagnosis methods into practice and the development of modern methods for the treatment of anomalies and deformities of the maxillofacial region, the incidence of complications due to this disease decreased from 37 to 7%. Currently, according to the Action Strategy for the five priority areas of development of the Republic of Uzbekistan in 2017-2021, the primary tasks for further improvement of medical care provided to the population of the country are timely prevention and diagnosis, provision of highly qualified, high-quality medical care, including patients with anomalies and deformities of the maxillofacial region through the use of modern technologies, this will improve the quality of life of various segments of the population.

To increase the effectiveness of early diagnosis and treatment of congenital and acquired anomalies and deformations of the maxillofacial region, a wide range of scientific research is carried out in the world, in particular, clinical diagnosis, proof of the causes of congenital and acquired deformations of the maxillofacial region becomes particularly important; substantiation of the mechanism of development of changes in subsequently congenital anomalies and deformations of the maxillofacial region; development of criteria for the diagnosis and treatment of congenital and acquired anomalies and deformities of the maxillofacial region; development of anthropometric and cephalometric indicators for various ethnic groups; development of standards for early diagnosis and treatment of this pathology; selection of standards for the treatment of patients, prevention of relapses and the introduction of modern methods to prevent secondary deformities of the maxillofacial region.

This dissertation research to a certain extent serves to solve the tasks provided for by the Strategy of Action on five priority areas of development of the Republic of Uzbekistan in 2017-2021, resolutions of the President of the Republic of Uzbekistan "On measures to further deepen the reform of the healthcare system" dated November 28, 2011 No. PP-1652, "On measures for the further development of specialized medical care to the population of the Republic of Uzbekistan for 2017-2021" dated June 20, 2017 No. 3071, as well as other regulatory documents adopted in this field of medical science.

The structure and shape of the head and face

S. G. Efimova [34 p.26] identified a chronologically traceable trend towards the appearance of neutral forms of the structure and shape of the head and face in some territories of Russia and CIS countries. For example, the zygomatic diameter increases in those groups that were characterized by its small size in the previous period. If previously there were average sizes, then such an increase in the zygomatic diameter is not observed. The increase in the height of the face was noted in parallel with the upper facial index. According to S.G. Efimova, the approach to the neutral variant also occurred in the direction of changing the shape of the skull, and shifts in the shape of the cerebral skull are more pronounced than in the facial region. The author has revealed that there is a different orientation of epochal changes among representatives of different races, associated with an increase in the characteristic features of a race or racial-ethnic group.

Despite this, many authors noted not only epochal changes in the shape of the head and face on the scale of a race or a large racial and ethnic group, but also the regional variability of small population groups [5;.26; 52;55;75; 83; 91; 260].

The territory of Siberia attracts the attention of researchers, including anthropologists, geneticists, historians, linguists, dentists [5; 27; 76; 84; 88; 150; 160; 179; 224]. During the Upper Paleolithic period, immigrants to America passed through this territory. The ancient "open" border of contact between Mongoloids and Caucasians is located in Western Siberia, where two large races mixed and there was a need for active study of mestization.

Mestization - the mixing of peoples and races - is a powerful process, considered as one of the most fundamental factors in the division of the human population into large and small races. Transitional and, most often, mixed by origin, sometimes undifferentiated racial types were formed in ancient times. These include the populations bordering between Caucasians and Mongoloids in Western and Southern Siberia, the Urals, Kazakhstan and Central Asia [5].

Thus, in the literature, the authors express contradictory data on the shape and structure of the skull and head in different peoples and in different periods of development, and in some sources the transience of these changes can be traced, within only two or three generations.

But the studies of the listed authors who published their results are experimental in nature, and, therefore, cannot be fully applied to living people. In this regard, it is especially important to establish the shape and size of the head and face with a normal bite.

S. I. Krishtab, examining children, found that pronounced brachycephalic bites are more common among physiological bites, while mesial bites are more common among pathological ones, and, conversely, orthognathic and distal bites in dolichocephalians, respectively.

However, it is known that the final formation of the maxillofacial system ends by the age of 16-21, therefore, the head and facial pointers change with age [31; 37].

The bite affects the magnitude of the mandibular angle, which varies significantly throughout life. In X-ray cephalometric examination of persons aged 18-29 years, according to V. N. Trezubov (1998), the value of orthognathic bite ranges from 112° to 134° (on average 119.8± 5.0°). The authors (Sapin M. R., Bilich G. L., 2001) [70] noted that the angle of the lower jaw in an adult is 110-130 °. The authors also provide contradictory information about the magnitude of the angle of the mandible in men and women.

G. G. Manashev (2000) found that in boys (aged 16-21 years) the angle is 128.3± 0.77 °, while in girls it is less — 114,19±0,38° [52; 55; 83].

However, different researchers who study the dental-maxillofacial system, and specifically the angle of the lower jaw, give contradictory parameters that range from 105° to 150°. There are few works on the ethnic features of the structure of the mandible [21; 151; 219].

The most contradictory results regarding the dependence of the angle on the shape of the face and head were obtained in separate studies. According to G. V. Kuznetsova [45 p.48], the angle of the jaw branch has a large value in leptoprozopes and a smaller value in eurioprosopes. On the contrary, I. I. Uzhumetskene (1970) noted the absence of a connection between the mandibular angle and the shape of the face. A. Benninghoff, K. Goerttler (1968) found that individual variations in the angle of the mandibular branch depend on the overall shape of the skull.

Anatomical variability of the cerebral and facial parts of the skull was revealed, which was determined by coordinated rearrangements in the dentition system [8; 22; 23; 24; 67;175]. However, these data are very contradictory. So, researchers (Khoroshilkina, 1999, 2003; Gioeva Yu. A., 2000; Zhulev E. N., Pestrikova V. N., 2000; Bratukhin N. B., 2001) [14; 36; 79; 85; 86] on the contrary, it is believed that the skull is formed at the beginning, and then the bite becomes. But the authors are unanimous in one thing - all organs of the craniofacial system have a mutual influence on each other.

The study by Brazilian scientists is devoted to the description of orofacial indices and indicators of facial proportions in adults, depending on the type of face and gender, and to determining the possibility of establishing a method for classifying face types based on anthropometry. The results obtained in the survey of 34 white men and 71 women show that the average values have significant gender differences: facial index, lower facial index, upper facial index and proportions of mandible height for men and proportions of mandible height for women. The following parameters were found to be significant for predicting facial types: facial index, upper facial index and the proportion of mandible height for dolichofacial type of men; and the proportions of mandible height for dolichofacial and lower facial index for brachyphacial type of women. In general, some indices and orofacial proportions in this variation correspond to the type of face and gender. The authors conclude that, in general, the anthropometric variables in this study are not good predictive values for determining the type of face [215].

The relationship between the parameters of the dental-maxillofacial system

Dentists and anthropologists have repeatedly noted the existence of a correlation between the size of teeth, length and body weight, as well as with elements of the skeleton and skull. L. L. Kolesnikov (2000), G. G. Manashev (2000), P. N. Sharaykin (2000), L. S. Persin et al., (2003), E. N. Anisimova (2004) noted that the correlation coefficients between the sizes of teeth and other parts of the human skeleton are small (no more than 0.2), but they slightly reduce the taxonomic value of odontometric features [9; 12; 44; 52; 65; 153].

T. I. Sanzhitsyrenova [69 p.17-18] (2000) noted high correlation coefficients between the parameters of teeth and dentition in Buryats. V. L. Tachiev et al. (2004) [78], on the contrary, pointed out the absence of a reliable relationship between the sum of the width of the upper incisors and the width of the dentition in the area of the first premolars in Kalmyks. Yu.G. Smerdina (1997) [74] established medium-strength relationships between mesiodystal tooth sizes and the parameters of dentition and apical bases in the northern Khakass and Chulym Turks.

These researchers, studying the size of teeth and dentition, did not pay attention to the parameters of the head and face. In this regard, a holistic view of the dental-maxillofacial system is not created.

The width of the dental arch in the area of the first molars, according to S. Izard (1950), is one third of the zygomatic diameter. And at the same time, the correlation coefficient was 0.88 between the two parameters, and also that the distance between the first molars was determined by the zygomatic width (cited by F. Ya. Khoroshilkina, 2004) [85].

Analyzing the sources given in the review, it should be noted that researchers mostly consider different parts of the head, face, and skull in isolation from each other. Describing the structure of the skull or head, they do not pay attention to the shape and structure of teeth, dental arches, bite, or vice versa, note the structure of the latter and at the same time do not provide data on the shape of the face and head, do not state signs of age and sexual variability.

Understanding facial harmony and proportions is important for facial reconstructive surgery and orthognathic surgery planning. In the literature, neoclassical facial canons have been revised in populations including North American whites and African Americans.

The aim of the Al-Sebaei (2015) study was to establish a baseline for individual anthropometric facial measurements and to verify the validity of 3 neoclassical facial canons in a cohort of young Saudi adults living in the Arabian Peninsula. To perform the study, a group of 168 healthy, aesthetically pleasing students from Saudi Arabia living in the Arabian Peninsula (93 men and 75 women aged 20-24 years) was selected). A caliper was used for measurements, three neoclassical facial canons were measured; three vertical heights of the face, the orbital norm (the distance between the medial and distal edges of the eye slit = the length of the eye slit) and the orbital-nasal norm (the distance between the medial edges of the eye slits of two eyes = the width of the nose) and was analyzed using the Student's t-test, a general linear modeling and paired comparison of averages. The results of the study: individuals have the same type of facial third and do not correspond to the orbital or orbital-nasal canons. The three studied neoclassical canons could not be confirmed in young people living in the Arabian Peninsula. Thus, aesthetic goals in reconstructive and orthognathic surgery should take into account ethnic characteristics [104].

Anthropometry is the science responsible for measuring a person's weight, size and proportions and provides valuable and objective information on how to characterize phenotypic variation and morphology [80]. Among the new methods of face analysis, the stereophotogrammetry method has shown excellent results, fast stereophotogrammetry cameras photograph objects from different angles. The authors (Alvaro Augusto Junqueira Junioretal, 2016) analyzed the profile of 60 individuals (30 men and 30 women), healthy young Brazilian adults, from 18 to 30 years old, in order to determine the general facial norms of the subjects, to create a database of measurements on the face. The methods used in the study provided an objective analysis of the facial profile of a group of healthy young Brazilian adults. Vectra M equipment has shown a high level of accuracy and stability [105].

L. G. Farkas et al. (2007) found that surgical correction of craniofacial deformity depends on accurate knowledge of the craniofacial norms of the patient's racial values. The norms of North American whites should be limited to patients of European descent and should not apply to people of other races. This study sought to identify differences in anthropometric measurements of the craniofacial complex between African-American and North American white subjects of both sexes of similar age (18-25 years). The research group consisted of healthy young African American adults, 50 men and 50 women. The analysis of craniofacial morphology was based on 51 anthropometric measurements: 9 cranial, 10 facial, 8 orbital, 14 nasal, 4 oral and 6 auricular. The results were compared with 51 norm indicators previously established for North American whites in the same age group. High differences between the groups were found in each craniofacial region, especially in the orbit and nose, and confirmed the need to establish separate standards for African Americans for surgical correction of the head and face [121].

H. Lawan Adamu et al. (2016) studied sexual demorphism, as well as sexual prediction using facial linear and angular measurements, among the Hausashtata ethnic group of Kano Nigeria. In conclusion, the authors concluded that gender discrimination can be established using linear dimensions and the angle of the face. The gender of an individual of the Hausa ethnic group can be determined using linear facial dimensions. Despite the sexual dimormism shown by the facial angles, only the nasal angle was a good sex discriminator [171].

Craniofacial anthropometric norms for young Malays were established by the authors [Ngeow W. C., Aljunid S. T., 2009]. The research group consisted of 100 healthy volunteers aged 18-25 years with an equal number of women and men who did not have a history of mixed racial origin. 22 linear measurements were taken twice from 22 landmarks in six craniofacial regions. As a result, it was found that the data of the Malays were similar in many similar dimensions to the Singaporean Chinese [195].

Radiographic cephalometry as a method of studying the structure of the face and bite in orthodontics

Many authors believe that to accurately determine the localization of morphological abnormalities in the facial skeleton and dental area with malocclusion, it is not enough to examine the patient and his diagnostic models [6; 11; 32; 81; 100; 114;144; 181]. Accurate recognition of abnormalities is an important component of the morphological and functional diagnosis, on the basis of which a targeted treatment plan and prognosis are based. To increase the amount of objective information about the patient's maxillofacial complex, various additional examination methods were proposed: graphical, anthropometric, X-ray, photostatic, functional and others [10; 25; 60; 72; 73; 81; 139; 142; 206; 212].

The most objective method of assessing the condition of dental-maxillofacial structures is the method of lateral telerentgenography of the head followed by cephalometric analysis of the X-rays obtained. The basis of the method is that strictly identical conditions are used in the production of images of patients, namely: a large focal length, which avoids significant projection magnifications and combines the bone structures of the same name on opposite sides of the face on the radiograph; the sagittal plane of the head is strictly parallel to the cassette; the central X-ray beam is always directed to the same point of the head perpendicular to the the sagittal plane. All this creates the necessary conditions for comparing serial images of one person and images of different people [13; 32; 50; 61; 72; 82; 145; 184.].

A large group of authors claims that the profile telerentgenogram (TRG) shows the shape, structure of the skull and facial skeleton in unchanged shape and minimally enlarged size. The method allows you to determine the proportionality of the maxillofacial skeleton, classify the norm and see the pathology taking into account the shape of the base of the skull, the relationship of the jaw bodies and the profile of soft tissues, study the relationship of dental arches with their bases, jaws with the skull, detect signs of growth and development, analyze the changes achieved as a result of treatment and evaluate its effectiveness. TRG analysis is important for solving the issue of indications for extraction of individual teeth in the treatment of malocclusion, for solving the issue of plastic and maxillofacial surgery [57; 58; 77; 82; 93; 112; 198; 204; 230].

For the first time in 1941, Brodie's work on the growth of the head from the age of three months to 8 years was published. The author performed TRG 6 months after birth until the age of 5, and then annually. Based on the analysis, he put forward his theory of parallelism, which suggests that the morphological pattern of the head is established by the age of 3 months or, perhaps, even earlier; once established, it does not change with age; the face does not change its inclination to the base of the skull and its growth is directed forward and down without "jumps and stops».

Most scientists emphasize that knowledge of the dynamics of the growth of the jaws and the face as a whole, understanding the interdependence of the growth rates of individual parts, knowledge of the direction of growth can and should be successfully used in planning the treatment of malocclusion and in predicting its success[20; 126; 188; 200; 220; 238; 247].

The base of the anterior cranial fossa is widely used as the reference plane when analyzing the position of the jaws in normal and malocclusion, as well as when evaluating treatment results. The facial and cerebral skulls, connected by a system of craniofacial sutures, are mutually influenced by each other. Periods of increased facial growth are associated with the formation of removable and permanent periods of bite. It has been proven that the upper jaw grows more in the areas of its junction with the bones of the base of the skull due to the apposition in the frontal area [237; 244].

In recent decades, orthodontists, being influenced by ideas about the connection between malocclusion and soft tissues of the face, have begun to study facial deformities with the facial contour, using lateral radiographs of the head

[99;103;138]. As indicated, the first practical application of the X-ray cephalometric analysis method was used, in addition to studies of growth and development processes, in evaluating treatment results. At the same time, analytical methods applicable in clinical practice for the study of norm and pathology are being developed, well-visible and stable anatomical points on the facial skeleton and skull on the lateral radiograph are being sought, as well as planes that connect these points [170].

Methods of cephalometric analysis

According to Bredy Kuning, by 1965 there were more than 130 methods of X-ray cephalometric analysis, which differed from each other in the types of measurements; cephalometric points selected by the authors for linear and angular measurements, as well as for determining the proportionality and types of the face; references to the least variable parts and areas of the facial and cerebral skull during growth and development. The latter serve as guidelines for comparing telerentgenograms before and after orthodontic treatment, as well as for evaluating treatment results. The most common methods of analyzing telerentgenograms in the world are Schwarz, Downs, A. Bjork, S. S. Steiner, L. Tweed, Mc Namara, A. Kim Rickets [32; 82; 132; 146; 183; 184; 210; 212]. Let's focus on the most important of them used in our work.

The Downs method. The standards derived from it are based on the study of cephalograms of 20 individuals (10 boys and girls) aged 12 to 16 years with perfectly correct occlusion, perfectly balanced function and aesthetics. Downs believes that knowing the differences in the relationship of teeth with the skeleton in such ideal people with respect to the face will be invaluable in detecting areas of disharmony in malocclusion. In the analysis, the author uses 9 angular and one linear measurement and divides it into two parts: I part - skeletal analysis and part - dental analysis. In the first part of the analysis, the skeleton of the face as a whole is studied through the angular relationships of these planes. The method of analysis is widely used in practice. The disadvantages of the method include the fact that great importance is attached to the facial angle, which is formed by two variable planes: the facial plane is variable due to the variability of the size of the symphysis, the Frankfurt horizontal is variable in itself.

Downs, studying the facial profile, noticed that the position of the lower jaw can mainly be used in determining the balance of facial proportions. He drew attention to the fact that facial proportions can be retroactive or protrusive, but the harmony of facial proportions will not be disturbed. The author conducted telerentgenographic studies in 20 American children, including children of the black race, with normal bite between the ages of 12 and 16, half of whom were boys, the other half were girls. Diagnostic models, photographs, and cephalometric images were taken from all the examined patients. Having studied their Downs, I derived the average measuring values. Downs chose the Frankfurt plane as the starting point for defining retro, ortho, and prognathies. Based on the data obtained, depending on the size of the facial angle N-Pg-Or-Ro, Downs identifies the following 4 types of faces: I–retrognatic face (facial angle is 82°); II – mesognatic face (facial angle is 87°); III – prognathic face (facial angle is 93°); IV – a true prognostic face (the facial angle is 90°). The latter, type IV of the face differs from type III in that the angle of convexity (LN-A-Pg) in type IV ranges from +9 to +12 °, and in type III it is 5 °. The author deduced the regularity of the ratio of the facial skeleton for each type of face and found a connection between the facial angle, the angle of the Frankfurt horizontal and the plane of the lower jaw. Downs measurements are divided into skeletal and dental. [32 c.37].

Of course, the methods proposed by other foreign researchers have their undeniable advantages. For example, A.M. Schwarz was the first to determine that the spinal plane of the SpP separates the area of the dentition and jaws from the skull. Thus, the author divided the facial skeleton into two parts: the gnatic one, located under the spinal plane, that is, the jaw with dentition, and the cranial one, localized above the spinal plane, that is, attached to the base of the skull. A.M. Schwarz called the gnatic part of the facial skeleton a dentofacial complex. The dentofacial complex can occupy a different position in relation to the base of the skull, which is associated with individual genetic features of the structure of the facial skeleton, as well as anomalies and deformations of the dentofacial apparatus. A.M. Schwarz emphasized that every specialist should be able to make a differential diagnosis of the genetic norm from the pathology caused by malocclusion. In facial aesthetics, the author paid special attention to the value of the volume of soft tissues, since these data can both neutralize and worsen the abnormal profile. A. M. Schwarz, taking into account the anthropometric studies of the head profile, identified three parts: craniometric, gnathometric and profilometric. Summarizing, A.M. Schwarz, to determine the individual features of the structure of the skull, you need to know two angles: the facial (LF) and the incline angle (LI). Thus, an individual genetic profile makes it possible to diagnose it from an abnormal one and determine whether it worsens or compensates for it. For example, a genetic profile with a forward-sloping chin significantly worsens the abnormal profile associated with progenia, while with a backward-sloping chin it will level it out [32 c.37-39]. These facts must be taken into account in terms of predicting the outcome of orthodontic treatment, since in the treatment of progenia, occlusion can be restored, but the chin protruding anteriorly will remain, which is unacceptable for the female in the aesthetic aspect. The orthodontist should warn the patient about such facts and, if necessary, resolve the issue together with the maxillofacial surgeon. Gnatometric studies under certain conditions help to identify the morphological features of various types of occlusion anomalies. The volume of the soft tissues of the face is crucial in the profilometric analysis. When choosing a treatment method, it is important to take into account the thickness of soft tissues, which can compensate for an incorrect profile, and in certain cases worsen it. [101; 106; 118; 123; 134; 140; 148; 154]. These facts have priority practical significance for the diagnosis and selection of the most optimal treatment method, occlusion abnormalities.

Engle's disciple and follower is Tweed, who has made a great contribution to the development of orthodontics. In particular, he developed the concept of uprighting teeth in the basal bone with an emphasis on the lower incisors, resumed tooth extraction and popularized the removal of the first premolars; he improved the clinical application of cephalometry, discovered the diagnostic facial triangle, developed the concept of step-by-step treatment and presented the preparation for support as the main stage in treatment; he developed a preorthodontic guiding program using serial removal of milk and permanent teeth. He discovered the diagnostic facial triangle, which was a diagnostic tool of cephalometry and an assistant in the choice of treatment [32].

The McNamara analysis was first presented in 1983. The FH and Ba-Na lines are used as the starting plane. In a normally balanced occlusion, the skeletal and dentoalveolar components of the jaws are harmonious with each other. ClII malocclusion is characterized by IV protrusion (skeletal prognathism). Due to the I/H protrusion, the dentoalvolar segment is also in front. This type of malocclusion can be effectively cured by extraoral traction in young patients, or by osteotomy according to Le Faure, 1 or in more severe cases by anterior osteotomy in / h in adults, the ratio of I/ h and n/ h is normal, there is a dentoalveolar protrusion. This type of malocclusion can be cured more easily by dental removal. It is necessary to accurately determine the difference between skeletal and dentoalveolar abnormalities. It is in this case that the McNamara analysis finds its application. The analysis is divided into: skeletal measurements, dental measurements, airways. It should be noted that this method is the only one that takes into account the condition of the airways, which is important for clarifying the etiopathogenetic mechanisms in anomalies of the dental system [17; 32; 212].

But, given the above, there is still no need to overestimate X-ray cephalometric analysis, because it is an additional method to clinical examination, and deviations of cephalometric indicators from the average are not a strict indication for treatment, especially if there is compensation in another area of the facial department.

Thus, the orthodontic literature contains a large number of different cephalometric analyses, but none of them is universal for achieving all goals, they all have disadvantages. For this reason, we consider it right to use several methods of cephalometric analysis for a particular patient at once. In addition, cephalometric analyses are often based on comparing the data obtained from the examination of a particular patient (group of patients) with the average values in this population (for example, Europeans). Therefore, in recent decades, a number of works have appeared in foreign literature devoted to the study of morphometric and cephalometric indicators of the norm for individual ethnic groups and nationalities, which have their own characteristics [98; 112; 120; 129; 133; 137; 141; 149; 163; 168; 187; 193; 211; 238].

Nevertheless, the indicators of norms developed by foreign authors need to be checked for their acceptability for people in our geographical area. The use of averages in the diagnosis of dental anomalies for our population is unlikely to be correct. For this reason, it is advisable to examine a group of people in the geographical zone of Central Asia with a formed orthognathic bite.

Facial aesthetics and functional occlusion are recognized as the most important goals in orthodontic treatment. A significant number of works have been devoted to the orthodontists' interest in facial contours and their racial variability. Studies of the cranial contour of many racial and ethnic groups in most cases aimed to assess specific typical anomalies compared to standards or "norms" created for specific racial or ethnic groups. Currently, we have excellent data from many ethnic groups on cephalometric norms. These include: Japanese, American Whites, Chinese, Australian Aborigines, Swedes, Africans, Hawaiians, and Canadians. Significant differences were identified in skeletal features and soft tissue profiles among white American, European, African American, Korean, Japanese, and Chinese populations. It has been proven that in Asian societies the incidence of malocclusion of class III is higher than in Caucasians. There have also been separate reports on the difference between the white populations of different continents and countries.

However, there have been no definitive studies on this subject taken from Bangladeshi people, a part of the population of the Indian subcontinent, ethnically called "Bangali", who have peculiar facial and physical characteristics with a peculiar lifestyle and culture [102].

To date, the number of patients in the Indian subcontinent using orthodontic treatment is increasing, orthodontic treatment is becoming popular in this region, and due to the lack of final regulatory data, cephalometric assessment of orthodontic patients in Bangladesh is not yet used. There is no standard by which to assess the degree of deviation in orthodontic treatment. Most orthodontists simply trust the regulatory data of Japanese or European population groups. The authors of this publication [Ali Ahsan et al.] set a goal: to determine the cephalometric norms for Bangladeshi adults and to investigate the nature and extent of these differences with the normative data of the Japanese and European populations. During the study, the results were obtained that the maxillofacial complex of Bangladeshi adults was located more anteriorly relative to the base of the skull (SN), compared with Japanese and European adults. In addition, the effective length of the upper jaw and lower jaw was shorter compared to Japanese and European adults. These findings were recommended by the authors for planning orthodontic treatment for Bangladeshi adults [102].

An article by a group of American dentists is devoted to cephalometric methods [214]. Scientists analyzed cephalometric radiographs of Japanese adults with normal bite. Soft tissue measurements were compared with measurements of a subgroup with a pleasant aesthetic appearance of the Japanese subgroup and samples of adult Europeans. During the measurements, cephalometric standards of lateral soft tissues of Japanese normal adults were used using cephalometric analyses of Rickets, Epkel, Holdway, Legan. Statistically significant differences were found in Japanese samples compared to European standards. The average values of the soft tissues of the Japanese group were similar to European standards, with the exception of the nasolabial angle and the protruding lip. Soft tissue cephalometric norms are specific to ethnic groups, but these values should not be interpreted as therapeutic purposes.

Normative data is an aid in the diagnosis and planning of orthodontic treatment and orthognathic surgery [214].

A comparative comparison of the cephalometric norms of Japanese and European adults in anteroposterior and vertical dimensions is presented in an article by Japanese researchers [Hideki Ioi et al. 2007], which determined linear cephalometric norms on 25 men and 24 women with normal occlusion in the anterior-posterior and vertical directions. These studies confirm the hypothesis that there are racial differences in cephalometric measurements between Japanese and European standards. The Japanese are more characterized by dolichocephaly, unlike brachycephaly, a more retrosive position of the chin, a protrusive position of the lower incisors and lips, unlike Europeans [137].

Methods of conducting cephalometric studies are constantly being updated and improved. One new method designed for cephalometric analysis of soft tissues is reported in an article by the authors (Arnett G. W.et al., 2004] The new method presents the possibility of radiographic examination, can be easily used by both orthodontists and dental surgeons when measuring the facial surface of soft tissues. The full functionality of the new method is given in the works of Arnett and Bergman " Facial keys to orthodontic diagnosis and treatment planning» [109].

The author M. Abdullah Aldrees (2011) believes that orthodontic diagnosis and treatment planning requires a careful assessment of the patient's cephalometric parameters and their comparison with known values of a specific ethnic population or norms. Despite the existence of several published studies on Saudi cephalometric standards, European standards are still used for Saudi patients. In order to reach a consensus between these studies and more accurately establish the cephalometric norms of the Saudis, the author of the article conducted a meta-analysis of the relevant literature. The average estimates of combined and SD total cephalometric measurements were calculated. The data included in this comprehensive meta-analysis were compared with European standards and the results showed that Saudis have different cephalometric traits. Saudi Arabian patients tend to have slightly more convex profiles and a larger incisor wedge than Europeans. These data confirm the previously published results and should serve as more accurate reference values that were taken from a large number of samples. [93].

The task of modern cephalometry is to assess the relationship between skeletal and dental functional units of the face for treatment and to establish the position of units horizontally and vertically (Proffit, Fields 2000) [212].

Iraqi scientists conducted a study to establish the normal values of the Wits score and the Tweed triangle. 95 students of the Faculty of Dentistry (41 men and 54 women) were examined on a digital lateral cephalometric X-ray. All patients had a normal bite and an acceptable profile for the study. The results showed that the average value of the Wits score was higher in men than in women with a negligible difference between both sexes, on the other hand, the angle between the Frankfurt plane and the plane of the lower jaw was higher in men than in women, while the angle between the Frankfurt plane and the incisors of the lower jaw was higher in women The angle between the mandibular plane and the lower incisors was almost the same in both sexes with a slight difference. The normal values of the Wits score and the Tweed triangle in the Iraqi subjects showed that in women it was close to the values of Jacobson, while in men these values were higher. As for the values of the Tweed triangle, both sexes showed greater proclinization of the lower incisors, and the angle between the Frankfurt plane and the plane of the lower jaw is closer to the values of Tweed [186].

Korean scientists (Hyeon-Shik Hwang et al. 2002) compared the soft tissue profiles of Korean and European-American adults with a balanced facial profile and identified ethnic differences in soft tissues between these two ethnic groups. The cephalograms of 60 Koreans (30 men and 30 women) and 42 adult European-Americans (15 men and 27 women) were tracked and digitized by one researcher. 10 angular measurements of the facial shape and 7 linear and angular measurements of lip positions were computerized. A comparison of the forehead bulge showed that there were no significant differences between the two groups. Korean samples had a smaller nasal incline angle and a larger lip protrusion compared to European – Americans. These differences should be used when drawing up a treatment plan for these ethnic groups [140].

A comparison of cephalometric norms between Mongolian and Korean adults with normal occlusion and a balanced profile is presented in an article by the authors [Ji-Hwan Kim et al, 2011]. The authors hypothesize that cephalometric norms specific to one ethnic or racial group may not always be applied to other ethnic types. Despite various anthropological studies, the linguistic genetic relationship between Mongols and Koreans, in cephalometric comparisons between these ethnic groups, sexual dimorphism was found in linear skeletal dimensions in a vertical skeletal ratio. Compared to Korean adults, Mongolian adults had a shorter front face height, a more extended chin, and straighter upper incisors. Some differences in soft tissue measurements were also revealed [149].Стоматологический анализ по стандартам Макнамары у мужчин и женщин иранского населения дан в статье авторов [Poosti M. et al., 2012]. Авторы доказали, что центральные резцы верхней и нижней челюсти у мужчин выступают значительно больше, чем у женщин [211].

The authors (Bhattarai P., Shrestha R. M., 2011) carried out a study that established norms for Nepalese residents. One hundred lateral cephalograms were studied by the same x-ray technique, and then tracked manually and all three angular parameters FMA, FMIA and IMPA were measured and 280, 560 and 960 were found, respectively. No statistically significant differences were found between Nepalese males and females, but there are very significant differences between Nepalese and Caucasians. [113].

McNamara cephalometric analysis is one of the most suitable analyses for diagnosis, treatment planning and treatment evaluation. The study by the Syrian authors is devoted to the study of McNamara standards for establishing cephalometric norms in Syrian patients with normal occlusion and comparing these norms between men and women. The study was conducted using lateral cephalometric radiographs of samples from 100 adolescents with normal permanent occlusion. The results showed that there are statistically significant gender differences between Syrians for 11 of the 15 cephalometric variables. The comparison showed statistically significant differences in most variables between Syrian men and women. The authors concluded that it would be preferable to use specific Syrian norms in the planning and treatment of orthodontic pathology [213].

The article is devoted to the analysis of orthodontic treatment of 275 patients in the period from 1970-1995 (Abdullah R.T.H., Kuijpers M.A.R., Berge S.J., 2006). Lateral cephalograms before (T1) and after orthodontic treatment (T2) were evaluated using Steiner analysis. The authors concluded that the prediction of cephalometric treatment results used in the Steiner analysis is not accurate enough to be used in orthodontic treatment [94].

The Filipino scientist in the article reports that he used cephalometric floating norms for work, describes the individual craniofacial structure of Filipinos based on five correlated variables in the form of a harmony box. The study was performed on 81 patients, 37 women and 44 men. Five digitized measurements of cephalometric angles were obtained. Pearson correlation coefficients described a high relationship between the five variables. Two-dimensional linear regression analysis was used to construct a harmony box, which contained cephalometric floating norms of five correlated variables. Multiple regression analysis and standard error of estimation were calculated to construct a harmony scheme that describes an individual craniofacial structure. Correlations between the five variables were significant at levels 001 and 05. Linear regression equations with corresponding r2 and standard error of estimation (SE) have been illustrated as a field of harmony. The multiple correlation coefficient R, R2 and SE was adjusted when one of the five measured variables was predicted, and the remaining four using multiple regression analysis were displayed as a harmony scheme [177].

Data on the determination of the norms of facial soft tissues in adult patients of Persian nationality according to the Holdway analysis are presented in an article by a group of authors. The researchers performed lateral cephalometric radiographs of 62 Persian adults with normal occlusion. The results were obtained: Persian adults have the same values of Holdaway soft tissue norms, with the exception of the bulge of the skeletal profile. The angle H, the main upper thickness of the protrusion, and the thickness of the soft tissues of the chin, are increased in Persians in relation to Holdaway norms. When comparing Persian men and women, it was found that the nose protrudes in men ($P<0.001$), the main thickness of the upper lip ($P<0.001$), the thickness of the upper lip ($P<0.001$), the lower furrow to the H line ($P<0.001$), and the thickness of the soft tissues of the chin ($P<0.001$) also more compared to Persian women. These observations are recommended when drawing up a treatment plan for patients of this ethnic group [106].

To carry out the study, the authors (Beugre J Bet.al 2007) measured lateral cephalograms in 53 young Ivorians, 50 young Senegalese and 62 young Chadzia, obtained under the same conditions, in each country. Ten skeletal, eleven dento-skeletal and twelve variable soft tissues were examined in order to examine whether there are differences between these African ethnic groups in facial morphology. Certain differences in the morphology of the face, skeleton and soft tissue were noted between the three African populations. This study provided a better knowledge of facial morphology in various African ethnic groups. The data obtained will allow for a better adaptation of treatment planning for cases requiring orthodontic and orthognathic surgical treatment [111].

The research results of Turkish scientists provide information on the study of ethnic differences in the cranial dimension between the Turkish and Saudi populations. Possible gender differences between men and women were also identified in those patients who had not previously undergone orthodontic treatment with normal occlusion and a balanced face. 163 cephalograms of adult ethnic Turks and Saudis were analyzed. The final data of the study: Turkish samples have a retrognatic position of the upper and lower jaw and a more vertical direction of facial development, Turkish men had a retrosive lip. Distinct differences were found in cranial structures between Turkish and Saudi youths [243].

Accurate and well-performed orthodontic diagnosis increases the likelihood of success in treatment. The Brazilian authors give a picture of the development of a computer system for maxillofacial diagnostics from a printed table of cranial analysis to a system with a Tweed-Merrifield complexity index-analysis, the development of computer diagnostics from manual to digital format. This technological innovation has become a useful tool for the orthodontist, contributes to more accurate analyses of the maxillofacial region, increases patient safety, and can be used for teaching and teaching students [178].

The article by the Japanese authors presents data comparing the classical method of tracing manually using a computerized method in which lateral cephalograms were scanned with a resolution of 300 dots per inch and digitized on the screen. Possible errors during tracing and digitization are analyzed. Thirty lateral cephalograms were scanned digitally at 300 dpi, at high resolution, processed twice by two operators using Dolphin 9.0, and using image processing software. Intragroup coefficient correlation (MUS) was used to detect intra- and inter-agreement estimates for each cephalometry variable. The results showed that each operator was consistent in repeated measurements, all ICCS were greater than or equal to 0.90, and none of the 95 percent of CONFI limits and ICCS had a lower bound less than 0.84. The agreements between the evaluators also showed a correlation coefficient greater than 0.75 of the angle of maxillary height, the depth of the maxillary axis x, FMA and nasolabial, and the distance N perpendicular to point A had a wider reliability interval and a lower correlation than the rest of the parameters tested. It is proved that the use of computer software for cephalometric analysis performed on scanned images does not lead to an increase in measurement error compared with manual tracing [221].

A group of authors from Korea compared the values obtained using 2 drawing methods (tangent and anatomical point) for constructing angles, as well as evaluating the intra- and inter-observational reproducibility of both methods. Statistically significant differences between 2 methods were identified, 9 out of 10 measurements were described and evaluated. When comparing the reproducibility of the estimated Pearson correlation analysis, both methods showed statistically significant correlations between repeated measurements. The anatomical point method showed great reproducibility using the Student's paired criterion. In the analysis of inter-observational reproducibility, 2 measurements showed significant differences using the anatomical point method, and 4 measurements showed significant differences using the tangent line method. In the analysis of inter-observational reproducibility, 5 measurements showed significant differences in the anatomical point method, while 6 measurements presented significant differences in the tangent line method. The authors claim that when analyzing the contours of soft tissues, the construction of lines using the anatomical point method is more accurate than the tangent method [140].

The human face is an extremely complex biological complex that obeys certain patterns of ethnic, sexual, and hereditary development and at the same time retains its unique individuality.

Work on X-ray cephalometric analysis of the so-called “norm" and sagittal malocclusion, as well as rich own experience in this direction, made it possible to conclude that the morphology of the skeleton strictly affects the position and inclination of the teeth and that morphology reacts appropriately to the abnormal position of the dentition, that there should always be proportionality between them and only in in this case, we have an aesthetically pleasing and functionally complete face. The specificity of the X-ray cephalometric assessment of the face and bite consists in the use of figures that reflect the linear dimensions of individual structures, as well as their angular relationships with each other through the use of separate anatomical points and planes, and the purpose of these measurements is to determine balance and harmony within the face and bite [222; 223].

Cephalometric data and morphological features of the structure of the facial skeleton and dental area in sagittal malocclusion, and morphological features of the distal occlusion say that the human body represents functional integrity and it cannot be that a change in one part of it does not lead to a change in the other. And since the facial skeleton and teeth are functional parts of the skull as a whole, variations in bite are associated with changes in facial and cranial structures..

Of great scientific interest are the possibilities of forming a differentiated approach in the examination and treatment of patients with physiological occlusion in restoring harmony of function and aesthetics of the maxillofacial system [59; 156; 185].

The analysis of telerentgenograms makes it possible to predict changes in the skeletal profile and changes in the profile of soft tissues during treatment. To decrypt and analyze TRG, computer technology is used, which allows you to speed up the decryption process, improve the accuracy and quality of analysis, reproduce TRG and store information about linear, angular, index indicators in the machine's memory [25; 152;168; 178; 207; 217; 225].

In recent years, a method of creating a three-dimensional digital image based on spiral computed tomography has been increasingly introduced abroad and in our country, followed by the manufacture of a three-dimensional plastic model that accurately reproduces its shape and dimensions. The obtained biomodels are the most convenient form of visualization of information for surgeons when planning surgical treatment, they allow for intraoperative complications during a trial operation on the model, significantly reduce the operation time (up to 30%), thanks to the ability to prepare the operation in advance, reduce the number of repeated corrections [130; 157; 158; 191; 194; 209; 239; 253].

To date, the problem of improving diagnostic tools and planning complex reconstructive and plastic surgeries in the craniofacial and maxillofacial areas remains urgent, which would allow for a more reliable assessment of the existing pathology, create an individualized surgery plan, and manufacture accurate individual endoprostheses in advance.

Treatment of patients with jaw deformities

According to the published results of clinical observations and experimental studies, orthodontic methods can correct the position of individual or entire groups of teeth, the shape of dental arches. However, it is difficult to achieve an increase or slowdown in jaw growth by orthodontic methods, especially after the end of the formation of the facial skeleton [127; 202].

Irrationally performed orthodontic treatment of skeletal deformities can change the slope of the front teeth, cause pathological processes in periodontal tissues, which is accompanied by resorption of the roots of the teeth [40; 63]. At the heart of bone reconstructive surgery is the task of moving the upper or lower jaw to the desired position in order to achieve a stable result. Deformities of the jaws are manifested by abnormalities of normal size, there is an incorrect position relative to other bones of the skull, both the facial and cerebral divisions. The goals of surgical treatment are directly dependent on the type of deformation and the ratio of dentition. However, the elimination of the skeletal form of jaw deformity does not occur during orthodontic treatment [15; 25; 64; 110; 211; 236].

In modern maxillofacial surgery, an important achievement is considered to be the expansion of indications for such operations. The main goals of such a comprehensive treatment of facial and jaw deformities are considered to be the achievement of: 1 - facial aesthetics; 2 - dental aesthetics; 3 - functional occlusion; 4 - healthy periodontal disease; and, finally, 5 - stable result. The goals of orthognathic surgery are to create a correct dental arch; restore normal occlusion; form an aesthetically harmonious face.

When evaluating the orthodontic treatment of skeletal forms and malocclusion, it was revealed that the possibility of conservative treatment in adult patients lacks an effective result. These conclusions are confirmed by the fundamental, experimental and clinical studies of the authors, which led to the development of methods of orthodontic surgical treatment of skeletal forms of jaw deformities and their further implementation [33; 38; 40; 49; 56;.53; 128; 165].

H. A. Kalamkarov [41], evaluating the results of orthodontic treatment of 850 children, indicated that it is possible to correct the position of the teeth and the shape of the dental arch. But in practice, the shape and size of the jaw, unfortunately, do not respond to orthodontic treatment. In this regard, the author recommends conducting scientific research on the development of surgical methods for the treatment of skeletal forms of jaw deformities. The treatment of patients with facial skeletal deformities, according to most clinicians, is necessary with an integrated approach. Specialists in their friendly research work should reasonably plan comprehensive treatment and the stages of its implementation.

Consequently, the urgency of the problem of treating patients with jaw deformities is undeniable, since the percentage of recurrence of deformities remains quite high.

S. E. Ivanova [40] analyzed the treatment of various types of pathology of the structure of the facial skeleton in more than 54 patients. The author determined the criteria for the movement of the upper and lower jaw, calculated the timing of treatment, and also indicates the need to preserve the volume of the oral cavity in order to prevent a recurrence of deformity.

Another author (A. Abdukadyrov) [2], when treating patients with enlarged vertical dimensions of the facial skeleton, the same concept is supported, namely: incorrect diagnosis of combined deformities of the jaws; irrational use of surgical methods of treatment; insufficiency of retention-fixing elements; lack of orthodontic training. At the same time, the author notes that many issues remain unresolved: there is no interaction between surgeons and orthodontists in carrying out complex therapeutic and rehabilitation measures; due to the interdigital fixation of osteotomized jaw fragments, it is not possible to use early functional load, doctors do not have a unified tactic for diagnosing and treating patients with jaw deformities, which often leads to irrational treatment, causes the development of complications and relapses.

Combined orthodontic and surgical treatment of maxillofacial deformities, normalizing forms of the function of the maxillofacial region, occlusion, aesthetics, should be carried out based on modern treatment concepts, taking into account the ethnic features of the structure of the maxillofacial region. When conducting orthodontic treatment, orthodontists need to have a plan for bone reconstructive surgery, and the treatment should be carried out according to a single tactic developed in collaboration with a maxillofacial surgeon [2; 54; 66; 87]. If orthodontic treatment is carried out irrationally, then this will negatively affect the surgical intervention.

In the process of orthodontic treatment, various designs of mechanically operating both removable and non-removable equipment are used. In orthodontic treatment at the postoperative stage, to prevent the development of relapses of deformities, it is necessary to create multiple fissure-tubercle contacts of antagonist teeth, to exclude the adverse effect of functional factors [23; 24; 30; 38; 62; 86; 114; 181].

In the modern period, orthodontists are introducing functional methods of treatment, since after mechanical treatment with existing devices, relapses of anomalies are often observed. However, in most cases, correction of occlusion anomalies is not possible without mechanical action on the dentition [159]. In this regard, simultaneously with devices that normalize the functions of soft tissues, mechanical elements are introduced into the design of functional devices for more efficient movement of teeth. It should be noted that functionally functioning orthodontic devices lengthen the treatment process. The focus of these devices is to establish a dynamic muscular balance, which is necessary to preserve the results of treatment, and not to change the morphological system. It is mandatory to use complexes including myohymnastics, mechanotherapy to ensure the stability of the results of surgical, orthodontic and orthopedic treatment. Some authors attach great importance to this [23; 47; 48; 68; 71; 89; 90].

A number of authors point out that orthodontic measures are required to ensure aesthetic and functional results, achieve their stability, and prevent relapses before, during and after surgery. However, there are many controversial issues when diagnosing dental-alveolar, as well as skeletal types of deformities. There is a need for detailed diagnostics, the use of modern X-ray examination, determining the scope of orthodontic treatment, identifying the role of an orthodontist in the treatment of various types of deformity, a differentiated approach to the treatment of certain types of deformity.

In the process of planning and conducting the stages of orthodontic surgical treatment of patients with combined jaw deformities, many unresolved issues arise. This is evidence that there is a need to develop new approaches in the diagnosis, planning, and implementation of combined methods of orthodontic and surgical treatment of patients. To improve the quality of specialized care, apply criteria for evaluating treatment results based on the analysis of telerentenogram indicators and the world experience of reputable scientists.

General characteristics of the examined material

A total of 3,552 students from various educational institutions in Tashkent were examined. Of which 96 ethnic Uzbeks with a formed normal bite, 49 girls and 47 men ("our group"), the standards of Mongoloids (southern Altaians) and Caucasoids (Russians) O.D. Baidik were used as a comparison group in anthropometric studies [12], Mongoloids (Koreans) for cephalometric studies Jae H.S. et.al [147], Caucasians (American whites) McNamara J.A. et.al [180]. All the subjects of ”our group” were born and live in the territory of the Republic of Uzbekistan, i.e. they grew up and formed in the same geoclimatic conditions. All measurements were carried out in the phototechnical laboratory of the Department of Orthodontics of the University of Rostock (Germany). The measurements were performed by 3D scanning of gypsum models and computer analysis using a special software package.

The determination of ethnicity was carried out by interviewing and clarifying the genealogy of representatives of four generations: 1) proband (the examined individual); 2) proband's father and mother; 3) paternal and maternal grandparents; 4) paternal and maternal great-grandparents. The survey included probands whose ancestors belonged to the same ethnic group.

The studied groups included persons selected according to the criteria of a normally functioning maxillofacial system of chewing efficiency, taking into account the CPI index (K - the number of carious teeth, P – filled, Y – removed, CPI – their sum in one person). At the same time, the absence of even one tooth on both jaws was not allowed. All the subjects did not have any morphological and functional deviations from the accepted norm and were characterized by the absence of clinical pathology. None of the previously examined patients received orthodontic treatment. The age of the volunteers is 17-25 years old. According to their social status, all the subjects are students of various educational institutions in Tashkent.

The dental examination included a visual examination of the oral cavity using a dental mirror and a probe. The dental formula was recorded in the protocol.

The bite was evaluated visually and clinically during preventive examinations, as well as on plaster models of the jaws according to six signs: 1- the upper lateral teeth overlap the lower ones to the depth of the longitudinal fissure, and in the frontal area the upper incisors overlap the lower incisors by 1/3 of the crown height; 2 -each tooth has two antagonists, except for the lower central incisors and upper third molars; 3- the coincidence of the midline between the central incisors; 4- the height of the crowns decreases from the central incisors to the molars, excluding canines; 5- multiple fissure-tubercle contact; 6- Class I occlusion according to Engle on the right and left).

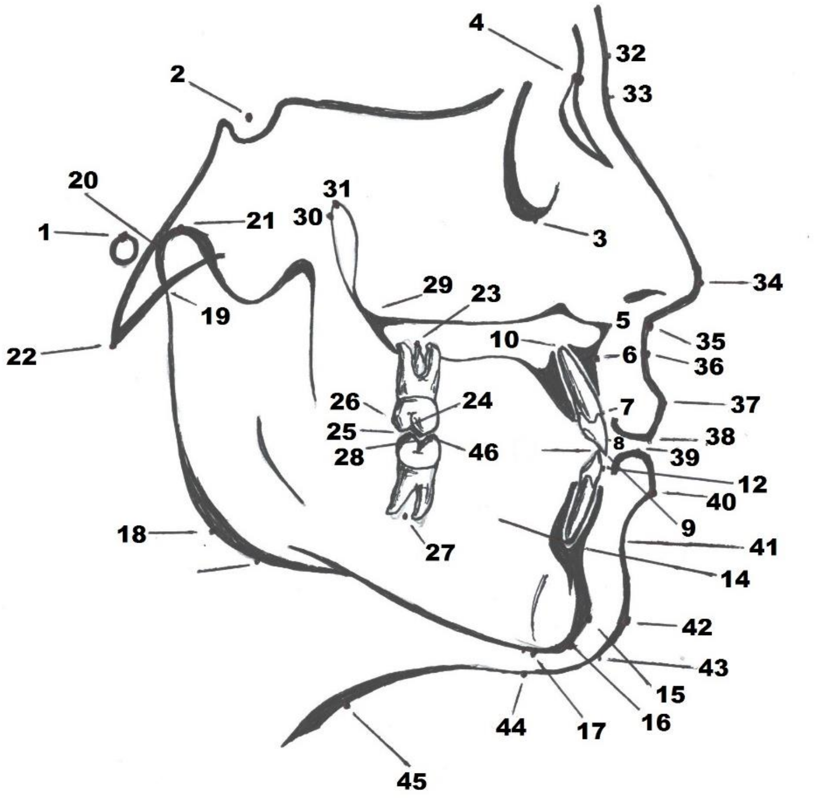
Methods of clinical examination

During the clinical examination of patients with jaw deformities, complaints were clarified, anamnesis of the disease was collected and examined. The anamnesis collection included: the age at which the disease first began, its nature, duration and timing of previous treatment. If there were indications, then consultations and treatment with general specialists, for example, an orthopedic traumatologist, were recommended. Next, a plan was drawn up for orthodontic and surgical treatment of jaw deformity, taking into account the conclusion of general specialists.

When examining the appearance of the patient's face, the ratio of the upper, middle, and lower parts of it, the symmetry of the right and left halves of the face were evaluated, with mandatory determination of the specifics of deformation in 3 planes. Anthropometric and radiological indicators were used to assess aesthetic disorders. They also studied the condition of the oral mucosa, assessed the position of the lips and tongue, the presence of cords and bridles, the nature of their attachment, took into account the shape and size of the dental alveolar arches, the condition of the gums, the shape and condition of the teeth and dental arches, the position of the teeth. Occlusions of dentition were evaluated in three directions. The presence of sagittal and vertical cleft, the relationship of canines, the first permanent molars, the depth of incisor overlap, the presence of dental alveolar elongation and shortening, as well as the coincidence of incisor lines, the ratio of buccal tubercles of the teeth of the upper and lower jaws were determined. The nature of speech, breathing, chewing, the degree of mouth opening and lateral movements of the lower jaw were taken into account. Clinical tests of mandibular movements were performed.

Cephalometric research methods

When performing the examination, we tried to adhere to the basic principles of X-ray cephalometric analysis developed over the past four decades. Conventional cephalometric points were used, which are usually well defined on cephalograms. In order to study in detail the structure of the facial skeleton and skull on cephalograms in the lateral projection, the following anthropometric landmarks were selected (Fig. 2.5):



1. porion (po) is the uppermost point of the contour of the external auditory canal;

2. sella turcica (S) - a point in the middle of the Turkish saddle;

3. orbitale (Or) - the lowest point of the edge of the orbit;

4. nasion (N) - the junction of the frontal and nasal bones or the deepest place of the outer contour of this junction;

5. spina nasalis anterior (sna) is the most protruding point of the anterior nasal spine;

6. subspinale (A) is the most deeply located point at the junction of the anterior nasal spine into the anterior wall of the alveolar process of the upper jaw;

7. supradentale (sd) is the most protruding point on the leading edge of the alveolar process at the necks of the upper central incisors;

8. incisive superior vestibulare (isv) - the most anterior point on the vestibular surface of the upper central incisor;

9. incision superior (is) - a point in the middle of the cutting edge of the upper central incisors;

10. apex incisivi superior (ais) - the point of the apex of the root of the central incisors of the upper jaw;

11. incision inferior (ii) - a point in the middle of the cutting edge of the lower central incisors;

12. incisive inferior vestibulare (iiv) is the most anterior point on the vestibular surface of the lower central incisor;

13. apex incisivi inferior (aii) - the point of the apex of the root of the central incisors of the lower jaw;

14. supramentale (B) is the deepest point of the anterior wall of the alveolar process of the mandible;

15. pogonion (Pg) is the most prominent point of the chin;

16. gnation (Gn) is the most prominent point of the chin, determined by drawing a tangent parallel to a straight line segment between the points pg and te;

17. menton (Me) is the lowest point of the symphysis of the mandible;

18. gonion (go) - the most prominent point of the angle of the lower jaw;

19. articulare (Ar) - the intersection of the anterior surface of the basilar part of the occipital bone with the posterior surface of the neck of the articular process of the lower jaw;

20. condilon posterior (sor) is the posterior point of the articular process;

21. condilon (Co) is the uppermost point of the articular process;

22. basion (Ba) is a point in the middle of the anterior edge of the occipital foramen.

23. apex molare superior (ams) is a point in the middle of the distance between the tips of the buccal roots of the first molars of the upper jaw;

24. molare superior (ms) - a point in the middle of the chewing surface of the first upper molars;

25. molare superior distal cusp (msdc) - distal tubercle of the upper first molar;

26. molare superior distalae (msd) is a point on the distal surface of the upper first molar;

27. apex molare inferior (ami) is a point in the middle of the distance between the tips of the roots of the first lower molar;

28. molare inferior (mi) - a point in the middle of the chewing surface of the first lower molar;

29. spina nasalis posterior (snp) is the most protruding point of the posterior nasal spine;

30.pterigomaxillare (Pt) is the distal upper point of the pterygoid fissure;

31. fissure pterigomaxillarae (fp)-the uppermost point of the pterygoid fissure;

32. gl is the most prominent point on the soft tissues in the forehead area;

33. n' is the deepest point on the soft tissues in the area of the bridge of the nose;

34. pronasale (rp) is the most prominent point on the tip of the nose;

35. subnasale (sn) - the place of transition of the base of the nose to the upper lip;

36. ss' is the deepest point on the anterior contour of the upper lip;

37. labium superior (ls) is the most anterior point on the red border of the upper lip.

38. stomion superior(sts) is the lowest point on the red border of the upper lip;

39. stomion inferior (sti) is the uppermost point on the red border of the lower lip;

40. labimn inferior (li) is the most anterior point on the red border of the lower lip;

41. spm' is the deepest point in the area of supramental shrinkage;

42. pog' is the most protruding point of the chin on soft tissues;

43. gn' is a soft tissue point corresponding to the gnation bone point;

44. me' is the lowest point on the chin;

45. c is the point of soft tissues at the junction of the lower jaw into the neck;

46. (mr) - the midpoint of the contact of the upper and lower first molars;

Для проведения цефалометрического анализа, впервые в нашей республике мы использовали для научных целей To carry out cephalometric analysis, for the first time in our republic, we used for scientific purposes software developed by specialists of Germany 3.2.5. FRwin ceph professional. This program is constantly being supplemented and updated, and is widely used in all leading and large clinics of the European community. 3.2.5. FRwin ceph professional allows you to effectively diagnose and predict the results of orthodontic treatment. The program includes a number of components:

software developed by specialists of Germany 3.2.5. FRwin ceph professional. This program is constantly being supplemented and updated, and is widely used in all leading and large clinics of the European community. 3.2.5. FRwin ceph professional allows you to effectively diagnose and predict the results of orthodontic treatment. The program includes a number of components:

- Management electronic registry and accounting
- Imaging work with photos
- Measurement of X-ray models, image position of the images and prediction of treatment results
- Statistical research search by parameters.

To obtain good quality materials in the program, the following conditions must be met:

- photographing the subjects, before - during - and after treatment, should be carried out under the same conditions and from the same focal length;

- when photographing jaw models, use a tripod calibrator (100 mm, transparent ruler)

- film radiographs should be photographed with a digital camera on a negatoscope, or scanned using a special scanner together with a calibrator (100 mm) to avoid possible distortions.

When using digital X-ray images, save them in bmp or jpg formats, and select the most contrasting image;

- when working with face photos, set the pupil line of the pupils at the same level.

To carry out cephalometric analysis, the points set by the program are set using a computer mouse, then the contours of teeth, jaws and soft tissues are automatically outlined (Fig. 1). Calculation and analysis can be carried out using more than 150 programs of cephalogram assessment techniques (Steyner, Tweed, Rickets, etc.), conclusions and conclusions are made automatically (Fig. 2). The significant difference between this program and its analogues lies in the horizontal integration with leading universities and clinics of the European Community. The company's engineers and programmers are constantly improving and reconfiguring the parameters depending on the individual wishes of the consumer, and thanks to this quality, the program is becoming increasingly widespread among leading clinics. To optimize the process of decoding cephalograms, a proprietary measurement technique was developed using the most common informative lines and angles, which greatly facilitated the work with the program. Similar measurements can be carried out on a facet cephalometric image.

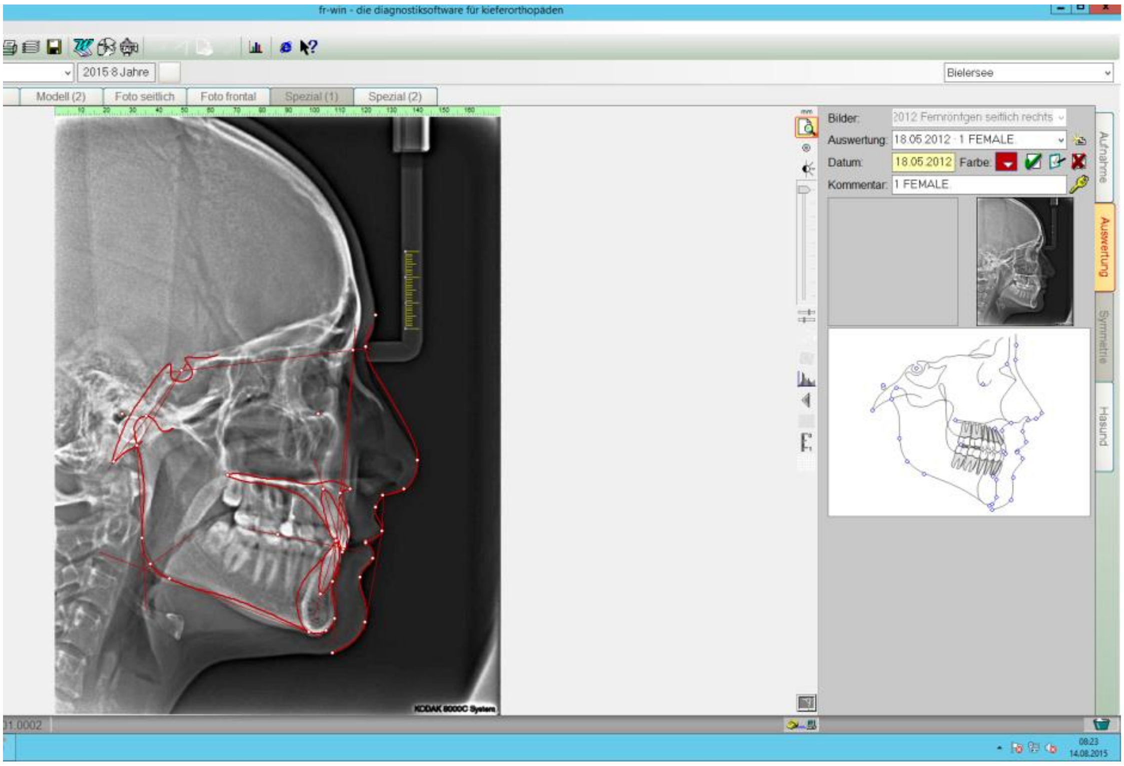


Fig. 1. X-ray cephalometric analysis by the FRwin ceph professional program

Variable	Norm	Auswertung 18.05.2012 1 Female McMAMARA	Differenz	Standardabweichung 5 4 3 2 1 0 1 2 3 4 5	verbale Einschätzung
Skeletal					
N senkr. zu A	0,5±0,5 mm	-3,9 mm	-4,4 mm		Mx Retrusion
N senkr. zu Pog		-6,2 mm			
Maxillary Length		79,2 mm			
Mandibular Length	97,0 mm	107,8 mm	+10,8 mm		
Md / Mx Difference	17,0 mm	28,6 mm	+11,6 mm		Class III
Upper Facial Height		54,5 mm			
Lower Facial Height	57,0 mm	56,4 mm	-0,6 mm		
Ration UFH / LFH	90,0±10,0 %	96,5 %	+6,5 %		
Mandibular Plane Angle	25,0±1,0 °	21,3 °	-3,7 °		Close
PgNB - Length	2,0 mm	1,9 mm	-0,1 mm		
Wits		-3,3 mm			
Facial angle	90,0 °	89,0 °	-1,0 °		Close
Porion Location	40,0 mm	40,0 mm	±0,0 mm		
Dental					
UK1 - APog	2,0±1,0 mm	-0,7 mm	-2,7 mm		Retrusion
OK1 - ANS	30,0 mm	23,4 mm	-6,6 mm		
UK1 - Me	40,0 mm	37,9 mm	-2,1 mm		
OK1 - AP	4,0±1,0 mm	0,8 mm	-3,2 mm		Retrusion
UK1 - Co	90,0 °	108,7 °	+18,7 °		Retrusion
Soft Tissue					
Upper Lip	0,0±2,0 mm	0,2 mm	+0,2 mm		
Lower Lip	-1,0±1,0 mm	3,2 mm	+4,2 mm		
Soft Tissue Pog	-2,0±2,0 mm	-6,2 mm	-4,2 mm		
Airways					
Upper Pharynx	12,0 mm	6,9 mm	-5,1 mm		Airways!
Lower Pharynx	18,0 mm	1,1 mm	-16,9 mm		Tongue!

Fig. 2. Results of X-ray cephalometric analysis by the F Rwin ceph professional program

The greatest information about the structure of the facial skeleton in the analysis of cephalograms is obtained by evaluating angular measurements. This was the reason why we started our research by studying these quantities. First of all, it was necessary to establish the difference in values by gender. To answer this question, angular measurements were performed on cephalograms of 47 men and 49 women. The obtained measurements are processed statistically and shown in the corresponding tables.

It was not possible to identify significant differences in the values of the angles of men and women in almost all angular parameters. Therefore, in this chapter and in the future, when conducting X-ray cephalometric analysis, the separation of the average values of angles by gender will not be carried out. Such a division is generally accepted.

To systematize the data obtained, all cephalometric parameters were divided into the following:

1. Craniometric
2. Maxillary skeletal
3. Mandibular skeletal
4. Interdigital
5. Vertically skeletal
6. Dental alveolar maxillary
7. Dentoalveolar mandibular
8. Interdental ratios
9. Soft-woven

Craniometric parameters

In this section, some craniometric linear and angular measurements will be considered.

All linear measurements are nothing more than determining the extent of a number of sections of the maxillofacial region between two bounding points, or between projections of these points on the nasal plane and the plane of the Frankfurt horizontal. By themselves, the absolute values of linear measurements are not of great value to the researcher, since their range is too wide. In contrast to absolute values, relative values provide more valuable information about the structural features of the facial skeleton.

In this section, the following linear measurements were carried out: the distance between the point S-N (the length of the anterior cranial fossa); the distance between the points S-Ba; the distance from the Turkish saddle to the distal border of the articular head of the mandible (S-Ar); the distance between the points Ba-N.

The measurement data of the above indicators are presented in Table 1. As follows from the table, the length of the anterior cranial fossa is 69.5± 0.40 mm in men and 64.7± 0.38 mm in women. The distance between the S-Ba points was equal to: for men - 46.7±0.44 mm, for women - 43.6±0.35 mm. The average values of the distance from the Turkish saddle to the distal border of the articular head of the lower jaw (S-Ar) are equal: for men – 37.8±0.51 mm, for women – 33.4±0.35 mm, the distance between the points Ba-N is 106.2±0.58 mm and 98.3±0.61 mm, respectively. A high degree of reliability of differences was found in all linear craniometric parameters ($P<0.001$).

Correlation analysis revealed that the linear dimensions of the jaws depended on the extent of the anterior cranial fossa. This relationship was positive, that is, the larger S-N distance, as a rule, corresponded to the larger bases of the jaws. This fact suggests that the difference in the linear dimensions of the anterior cranial fossa and the base of the upper and lower jaw will serve as a good diagnostic indicator.

A comparison of our subjects with other ethnic groups, in particular with Mongoloids and Caucasians, revealed that the sizes of the craniometric indicators of the SNmm and SBa of our ethnic group were significantly lower than Table.1

Due to the absence of significant statistical differences in the sex indices of angular measurements of NSBa, the inclination of the base of the skull to the Frankfurt horizontal (SN-FH), NSAr, we suggest using one common method in clinical practice - 128,9±0,44°, 5,2±0,15° and 124.4±0.78°, respectively.

Table 1

The results of craniometric studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P

NSBa	128,5±0,65	129,2±0,60	128,9±0,44	>0,05
SNmm	69,5±0,40	64,7±0,38	67,0±0,37	<0,001
SN-FH	5,2±0,21	5,2±0,21	5,2±0,15	>0,05
NSAr	123,5±1,43	125,2±0,64	124,4±0,78	>0,05
SBa	46,7±0,44	43,6±0,35	45,1±0,32	<0,001
S-Ar mm	37,8±0,51	33,5±0,35	35,6±0,38	<0,001
BaN	106,2±0,58	98,3±0,61	102,2±0,58	<0,001

As can be seen from Table 3.9, when comparing our subjects with other ethnic groups, in particular with Mongoloids and Caucasians, it was revealed that the values of the angles SN-FH NSAr NSBa in our ethnic group were significantly lower (P<0,05, P<0,001).

The difference in the absolute size of the head and individual organs of the maxillofacial region in men and women was noted even when examining the subjects, when getting acquainted with their cephalograms, as well as when comparing jaw models. As a rule, men had a large skull, a large mass of soft tissues covering the facial skeleton was conspicuous, and men's dental arches were more often large. As expected, statistical processing of the obtained data revealed a significant significant difference in the main linear measurements in men and women.

It should be noted that during the cephalometric analysis, we tried to make measurements with respect to the FH and SN planes as much as possible. In clinical practice, certain difficulties are created with the outline of the Frankfurt horizontal, since it is not always possible to clearly see the points of Ro and Og on the X-ray. Therefore, today in many university clinics, when conducting cephalometric analysis, preference is given to the SN plane. Since finding its reference points is not such a laborious task. In addition, we found that the angle of inclination of the base of the skull to the horizontal plane SN-FH, as a rule, was open anteriorly, this was observed in all subjects. Thus, it can be concluded that for persons with orthognathic occlusion, positive values of this angle are characteristic, and gives us a reason to use the SN plane if necessary.

Maxillary skeletal parameters

The anterior facial angle for the upper jaw (SNA) is formed by the cranial plane (SN) and the facial plane (NA), where N corresponds to the point of the bony nasion, and A corresponds to the anterior edge of the apical base of the upper jaw (the deepest point under the type nasalis anterior). The facial angle indicates the position of the upper jaw and, in general, the entire maxillary complex relative to the plane of the base of the skull along the sagittal line, i.e. in the anteroposterior direction and is widely used nowadays in many cephalometric analyses. The average typical values of the anterior facial angle SNA for the upper jaw are given in table No. 2, from which it follows that in men this angle is 82.9 ± 0.53°, in women 82.1± 0.44°, but the differences are not significant.

It should be noted that the dependence of the bite structure on the position of the face in the skull was pointed out by a number of authors. It is expressed by means of the angle SNA determines the position of the upper jaw along the sagittal in relation to the nasion point.

Of particular interest is the measurement method proposed by Ms Namara, which determines the antero-posterior position of the upper jaw in relation to the cranial base. The technique consists in determining the distance between the nasion perpendicular and point A. The starting plane for this measurement is the Frankfurt horizontal. In men, this indicator was 1.5 ± 0.53 mm, in women - 2.7±0.39 mm, but the standard deviation (table) and the arithmetic mean error are greater than the average due to strong variation. We will try to explain these results in more detail in the following chapters of our work when comparing the results obtained with foreign data. Although this indicator is expressed in millimeters, it is very close to SNA in nature. This is confirmed by the negative significant relationship between Nasion perpendicular, SNA and NAPog. The interdependence of these angles is explained by the fact that one of their constituent sides, namely the N-A line, is common to both NAPog and SNA. The second and main reason for the change in the SNA angle is the rotation of the gnatic part of the facial skeleton relative to the base of the skull. The proof of this is the negative correlation of SNA, Nasion perpendicular with the angles SN/PP SN/MP NSGn and the lack of connection with the angle of the mandible Ar GoMe.

Table 2

The results of maxillary skeletal studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
SNA	82,9±0,53	82,1±0,44	82,5±0,35	>0,05
N⊥A	-1,5±0,53	-2,7±0,39	-2,1±0,33	>0,05
Max.lenght	90,1±0,54	82,8±0,50	86,4±0,52	<0,001
oberkieferlange	51,9±0,52	47,8±0,44	49,8±0,40	<0,001

The presence of a positive association – SNA, Nasion perpendicular with SNPog and a negative one –SN/PP confirms the second idea about the reasons for the change in SN/PP values.

As can be seen from Table 3.9, this angle is universal for all ethnic groups, which is confirmed by the absence of a distinction between the three ethnic groups.

Linear measurements showed significant differences in Effective midfacial length (Co-A) and Oberkieferlange (sna-snp), which amounted to 90.1±0.54 mm, 51.9±0.52 mm in men, 82.8±0.5 mm, 47.8±0.44 mm in women, respectively (P<0,001).

Mandibular skeletal parameters

Anterior facial angle for the mandible (SNB) this angle characterizes the mesio-distal position of the anterior part of the apical base of the mandible in relation to the base of the skull. In men, it was 80.3±0.53°, in women 79.6±0.44°. Since no significant difference was found, its average value for the examined patients can be applied - 79.9±0.34°.

The length of the mandible body (Go-Me), as well as other linear measurements, had sex differences, in men this indicator was 73.9±0.82 mm, in women 68.5±0.65 mm.

The anteroposterior position of the mandible in relation to the cranial base is determined by the distance between the nasion perpendicular and the Pog point in mm. The starting plane for this measurement is the Frankfurt horizontal. Since no significant difference in typical indicators was found, its average value for all examined patients can be applied -7.2± 0.64 mm, but the standard deviation and the arithmetic mean error had a large numerical value due to the strong variation, as well as in the case of the anteroposterior position of the upper jaw. This circumstance will be considered in detail in the following chapters of the work when compared with foreign literary data.

It was not unexpected to find a strong positive correlation between the parameters of the SNPog FHNPog Nasion perpendicular and the point Pog, SNB. Evidence of the displacement of the gnatic part of the facial skeleton relative to the plane of the base of the skull is the presence of an inverse relationship between Nasion perpendicular to the Pog, SNB and SNPP, SNMP point, the absence of a significant relationship between NAPog and SNB, (Table 3). Changes in the latter have little effect on the value of –NAPog as a result of simultaneous rotational displacement of the entire gnatic department. The weak connection between the above-mentioned angles gave reason not to divide the subjects into groups depending on the position of the anterior part of the lower apical base in the skull.

Table 3

The results of mandibular skeletal studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
SNB	80,3±0,53	79,6±0,44	79,9±0,34	>0,05
Go-me mm	73,9±0,82	68,5±0,65	71,2±0,59	<0,001
N⊥POG	-6,6±0,99	-7,9±0,82	-7,2±0,64	>0,05
Mand length	120,4±0,83	110,7±0,57	115,5±0,70	<0,001
NGoMe	70,5±0,74	71,8±0,64	71,2±0,49	>0,05
unterkieferlange	79,7±0,82	74,0±0,69	76,8±0,61	<0,001
GoGn-SN	25,7±0,85	27,9±0,72	26,8±0,57	<0,05
SNPg	81,6±0,56	80,6±0,47	81,1±0,36	>0,05
ArGn	113,1±0,74	103,9±0,61	108,4±0,67	<0,001
FH-NPOG	86,6±0,50	85,8±0,43	86,2±0,33	>0,05
convexity NAPog	177,1±0,82	176,8±0,54	176,9±0,48	>0,05
Post Face Ar-Go	54,9±0,74	48,5±0,56	51,7±0,57	<0,001
PgNB	2,6±0,29	2,0±0,15	2,3±0,16	>0,05

The facts justifying the rotational displacement of the jaws include the pronounced average negative relationship of SNB with SN/OccP and the absence of its dependence on the angles of PgNB.

In the study of cephalograms, there was no relationship between the SNB and the angle of the mandible.

In addition to the SNB indicator, the SNPog and NSGn angles perform a similar function. The first one duplicates the SNB to some extent. They differ only in one starting point. Typical SNPog indicators, as can be seen from Table 3.3, did not have a significant difference. As a result, it is possible to use the average for all surveyed 81.1±0.36°. The SNPog angle demonstrates the antero–posterior position of the most prominent point of the chin – pogonion - in relation to the plane of the base of the skull, and also serves as a characteristic of the severity of the chin segment of the lower jaw. To do this, it is enough to use two craniometric indicators -the SNB and SNPog angles. The difference between the angles of SNB and SNPog, or in other words PogNB, shows the degree of protrusion of the chin in relation to the nasion point, or rather the degree of steepness of the front surface of the chin. Moreover, the relationship between this degree and the magnitude of the angle is direct.

The angles NSGn, SNPog, as well as the degree of inclination of the mandible to the base of the skull and SNB give the most complete picture of the position of the mandible in the skull.

The measurement of the effective length of the mandible (Co-Gn) and the distance between the Ar-Gn points revealed significant differences that amounted to 120.4±0.83 mm, 113.1±0.74 mm in men, 110.7±0.57 mm, 103.9±0.61 mm in women, respectively.

The index of the length of the mandible branch (Post Face by Tweed) the distance between the Ar-Go points in men was 54.9±0.74 mm, in women 48.5±0.56 mm. (Table 3).

It is impossible to exclude a change in the angle of the SNB due to an increase in the size of the jaws themselves, as evidenced by the presence of a positive correlation between SNB GoMe, Co-B, Ar-Gn (Table 11).

Parameters of inter-jaw relations

The anteroposterior relationship of the apical bases of the upper and lower jaw relative to the nasion point represents the basal angle-ANB. It is considered positive if the point “A” is located ahead of "B ”.

With the inverse ratio of points, the ANB value is taken with a minus sign. If the points N, A, B are on the same straight line, the basal angle is zero. In this case, we are dealing with a truly direct profile. The second way to determine the value of the angle ANB SNA is SNB=ANB. It can be seen from table 4 that the typical indicators of the basal angle differed significantly in the gender aspect. Since no significant sex difference was found, we consider it advisable to use its average value for both sexes of 2.7±0,18°..

Таблица 4

The results of jaw-to-jaw skeletal studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
ANB	2,7±0,28	2,6±0,23	2,7±0,18	>0,05
WITS mm	0,09±0,27	-0,4±0,32	-0,1±0,21	>0,05
Md/Mx difr	30,3±0,57	27,9±0,44	29,1±0,38	<0,01
ODI	76,2±0,66	74,1±0,70	75,2±0,49	<0,05
APDI	84,1±0,68	84,1±0,54	84,1±0,43	>0,05
Ant Face PP пер к Me	67,0±0,69	61,4±0,50	64,1±0,51	<0,001
IndexPost Face/Ant Face	82,8±1,24	79,2±0,99	81,0±0,81	<0,05

The basal angle depended on N⊥A and had a weak negative relationship with N⊥Pog. The first is probably explained by the varying degree of development of the anterior part of the upper basal arch, the variability of which has already been noted. This version is supported by a weak dependence of the basal angle on the length of the base of the upper jaw, lower jaw and angles SN/PP, PP/MP.

The influence of the basal angle on the relationship of the central incisors with the bases of the jaws of the same name and the incisor angle is highlighted in the gnathometric section of the analysis.

The flat position of the lower central incisors, and, consequently, the distal displacement of the anterior border of the lower basal arch contributes to an increase in the basal angle.

The steep position of the lower central incisors is accompanied by small values of the angle ANB. These conclusions are confirmed by the presence of a positive average correlation of the basal angle with Npog 1mm and UK1-Apog

Wits-number is a parameter characterizing the relative position of the apical bases of the jaws in the anteroposterior direction relative to the occlusal plane.

As mentioned earlier, vertical problems can be determined by the gonial angle, the angle of the mandibular plane, the ratio of the anterior and posterior facial height.

O.D.I. is one of the objective indicators of the vertical relationship of the jaws. To determine the ODI, the sum of the angles is calculated: 1–the angle formed between the Palatinal plane (PP) and the Frankfurt horizontal (FH), 2 – the angle between the Anterior facial plane (AB plane) and the mandibular plane (MP). In men, this was 76.2±0.66°, in women 74.1±0.70°. Since no significant sexual difference was found, we consider it advisable to use its average value for both sexes - 75.2 ± 0.49° (Table 4).

The shift of indicators in a smaller direction, relative to the average value, indicates a tendency to a skeletal open bite, in a larger direction – to a deep one.

In the treatment of anomalies, the index of sagittal jaw relationship APDI is widely used. To determine which the sum of three angles is calculated: 1–the front angle (FH-NPog), 2–the angle A-B of the plane c NPog, 3-formed between the palatinal plane (PP) and the Frankfurt horizontal (FH). The average APDI value in the study of both sexes is 81.4°±0.43°. A lower value indicates distal occlusion, or a tendency towards Class II, a higher value indicates mesial occlusion or a tendency towards class S. With this measurement, a differential diagnosis can be made when planning treatment.

Ant face representing the distance formed by drawing the line perpendicular to the point Me from the PP plane.

Vertical-skeletal parameters

The direct indicators of the inclination of the gnatic department to the plane of the base of the skull are angles, SN-PP, SN-OccP, SN-MP. As follows from Table 5, the sex differences between the SN-OccP angle indices were not reliable. This allows you to apply a common indicator for the entire group of subjects. The average SN-OccP angle was 14.8±0.36°.

When considering the average typical values of SN-MP angles, a significant decrease was revealed in men compared with women, which amounted to 27.6±0.88° in men and 30.3±0.73° in women, respectively (Table 5).

It was not possible to find a significant difference between the Bjork (SNAr+ArGoMe+SArGo) angle sum index for men and women, therefore, an average figure common to the subjects can be applied, which is 387.5±0.89° (Table 5).

The horizontal position of the gnatic department is characterized by the following indicators:

1) 1) The angle of inclination of the occlusal plane to the horizontal (Frankfurt) plane OcP-FH.

2) 2) The angle of inclination of the base of the lower jaw to the horizontal (Frankfurt) plane MP-FH.

The angle of inclination of the occlusal plane to the horizontal plane of the OcP-FH, as a rule, was open in front. This was the case with all the subjects. Thus, it can be concluded that persons with normal bite are characterized by positive values of the angle of inclination of the upper jaw to the horizontal plane. It was not possible to find a significant difference between men and women, so we can apply the average figure common to the subjects, which was 9.6 ± 0.34.

When considering the angle of inclination of the base of the lower jaw to the horizontal plane FH-MP, a significant decrease was revealed in men compared with women, whose values were 24.6±0.77° in men and 27.1±0.67° in women, respectively (Table 5).

As can be seen from Table 3.9, when comparing our subjects with other ethnic groups, significant differences in the value of the FM angle were significantly 2°lower (P<0.05).

It should be noted that there is a significant positive correlation between the angles SN/PP and SN/MP SN/OccP FH/OccP Table 11. Consideration of the correlation of these This does not cast doubt on the version proved in the previous sections about the rotational displacement of the gnatic part of the facial skeleton.

Table 5

The results of vertical inter-jaw studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
SN-PP	8,0±0,55	8,6±0,41	8,3±0,34	>0,05
SN-MP	27,6±0,88	30,3±0,73	29,0±0,59	<0,05

MP-PP	19,7±0,84	21,8±0,68	20,8±0,55	>0,05
ArGoMe	117,0±1,02	118,5±0,79	117,8±0,64	>0,05
NSGn	67,1±0,59	67,5±0,44	67,3±0,37	>0,05
FH Occl	9,0±0,50	10,2±0,46	9,6±0,34	>0,05
FMPA	22,3±0,84	25,2±0,71	23,8±0,57	<0,05
FHGoMe	24,6±0,77	27,1±0,67	25,9±0,53	<0,05
OcP-SN	14,2±0,54	15,3±0,48	14,8±0,36	>0,05
Sumenwinkel S-N-AR+AR-Go-Me+S-Ar-Go	387,5±0,89	390,3±0,73	389,0±0,59	<0,05

The vertical interjaw relationship is characterized by an angle formed by the intersection of the planes of the bases of the upper (PP) and lower jaw (MP). The average data of its value are presented in Table 5. From the table, it can be seen that the obtained average values did not differ significantly between men and women. Therefore, you can use the general average of 20.8+0.55°.

When analyzing the interjaw relationship, a significant positive correlation of the interjaw angle with BJORK was found. Therefore, it can be concluded that the more developed the lower half of the face, the greater the magnitude of the jaw angle. It was also noted that with an increase in the maxillary angle, the angle of the lower jaw increases. This is proved by the average positive correlation between them (Table 11).

Above, when analyzing the inter-jaw relations, it was pointed out that there is a weak feedback between the PP/MP angles and the interstitial angle. That is, different interdigital angles can correspond to the same incisor angles and vice versa.

Based on the above, it can be concluded that the maxillary angle (PP-MP) is an indicator of the development of the jaw bodies, alveolar processes and dental arches in the anterior part of the lower face.

The angle of the mandible is formed by the intersection of the plane of the ascending branch of the mandible (Ah) with the plane of its base (MP). The magnitude of this angle in the study group ranged from 102.10 to 136.10. Its average values, depending on gender, are presented in table 3.4. It follows from the table that no significant inter-gender differences were found, therefore, you can use the general average figure 117,8°±0,64°.

As can be seen from Table 3.9, when comparing our subjects with other ethnic groups, it was revealed that there were significantly low values of SN-MP and ArGoMe indicators for Mongoloids ($P<0.05$, $P<0.001$).

The relationship of the angle of the mandible with a number of cephalometric indicators is presented in Table 5, which shows the presence of a negative average correlation with the length of the mandible body, the height of its branch and relative independence from the depth of the incisor overlap.

It is interesting to note that the value of the mandibular angle is influenced by the orientation of the mandible in the skull and the mandibular angle. The angle of the lower jaw increases when the lower jaw body acquires a steeper position, which is confirmed by the presence of a positive average correlation with its angles SN/MP and FH/MP (Table 11).

The study of the NSGn angle showed that one common indicator of 67.3+0.37° can be used, since no significant difference was found between men and women. Some correlations of this angle are presented in Table 11. It can be seen from the data in the table that it does not depend on changes in the NSAr distance and has a weak negative correlation with the S-Ar distance. The absence of dependence on changes in the S-Ar distance speaks against the possibility of a rectilinear anteroposterior displacement of the lower jaw, which is one of the proofs of rotation of the gnatic part of the skull.

Dental alveolar maxillary parameters

The vertical orientation of the central incisors is indicated by the angle of inclination OK1NA° and the distance from the cutting edge of the central incisors to the vertical nasal plane OK1NA mm and OK1NPog mm.

The angle formed by the axial line along the upper central incisor and the vertical nasal plane, (NA), was 19.4°+0.90° in men and 19.5+0.80° in women (Table 6). The millimeter value of the distance of this measurement from the cutting edge of the upper incisor to the vertical nasal plane NA and NPog was 3.5+ in men0.31 mm, 5.6+3.8 mm in women 4.2+0.28 mm, 6.3+0.36 mm, respectively (however, these figures have a huge spread).

The idea of the horizontal position of the upper central incisors in space is given by the angle of inclination of the upper central incisors to the horizontal (Frankfurt) plane OK1-FH. The results of the study did not show significant sex differences, so we can use one average value for all the surveyed - 107.2+0.62°.

Comparing the data of our subjects with other ethnic groups, in particular with Mongoloids and Caucasians, revealed that the values of the angles OK1-SN, OK1-NA, OK1-NAmm, OK1-FH in our ethnic group the groups were significantly lower (P<0.01,P<0,001).

Table 6

The results of dental alveolar maxillary studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
Npog 1 mm	5,6±0,55	6,3±0,36	5,9±0,33	>0,05
OK1-ANS	23,3±0,36	22,7±0,23	23,0±0,21	>0,05

OK1-AP	2,8±0,34	3,1±0,27	3,0±0,22	>0,05
OK1-SN	102,3±1,00	101,7±0,81	102,0±0,64	>0,05
OK1-NA	19,4±0,90	19,5±0,80	19,5±0,60	>0,05
OK1-NAmm	3,5±0,31	4,2±0,28	3,8±0,21	>0,05
OK1FH	107,6±0,97	106,9±0,78	107,2±0,62	>0,05

The indicator of the inclination of the upper central incisor to the plane of the base of the skull is the angle, OK1-SN. As follows from Table No. 6, the sex difference between the OK1-SN angle indicator turned out to be unreliable. This allows you to apply a common indicator for the entire group of subjects. The average OK1-SN angle was 102.0°±0,64°.

Dental alveolar mandibular parameters

In this section, the indicators presented in Table No. 7 were used to characterize the dental alveolar mandibular relationships, from which it follows;

The vertical orientation of the lower central incisors is indicated by the angle of inclination UK1NB° and the distance from the cutting edge of the central incisors to the vertical nasal plane UK1NB mm and UK1NPog mm.

Table 7

The results of dental alveolar-mandibular studies

in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
Npog 1̄mm	2,7±0,52	3,5±0,35	3,1±0,31	>0,05
UK1-Apog	1,8±0,32	2,5±0,25	2,2±0,21	>0,05

UK1-ME	42,9+0,42	39,4+0,35	41,1+0,32	<0,001
UK1-Co	93,8+1,12	92,3+0,94	93,1+0,74	>0,05
UK1-NB	24,1+1,04	25,8+0,83	24,9+0,67	>0,05
UK1NBmm	4,6+0,37	4,9+0,29	4,8+0,24	>0,05
FMIA UK1-FH	61,4+1,16	59,0+1,01	60,2+0,78	>0,05
IMPA UK1-ML	96,2+1,01	95,9+1,02	96,1+0,72	>0,05

The angle formed by the axial line along the lower central incisor and the vertical nasal plane (NB) was 24.1+1.04° for men and 25.8+0.83° for women. The millimeter measurement values of this distance from the cutting edge of the upper incisor to the vertical nasal plane NB and NPog were 4.6+0.37 mm, 2.7+0.52 mm for men - in women, 4.9+0.29 mm, 3.5+0.35 mm, respectively (however, these figures have a huge spread).

The horizontal position of the lower central incisors in space can be judged by the values of the angle of inclination of the upper central incisors to the horizontal (Frankfurt) plane UK1-FH. Also, as in the case of the upper central incisor, the results of the study did not show significant sex differences, so you can use one average value for all examined 60,2+0,78°.

Our group of subjects has a significantly lower FMIA angle (on average by 5 (P<0.001).

A negative correlation was noted between the angles UK1/NB and UK1/FH, similar to the relationship between the vertical and horizontal angular landmarks of the jaws and the occlusal plane. The relationship between the angles OK1/NA and OK1/FH is positive, because when the hypotenuse (in this case, the plane of the central upper incisors) rotates around the vertex of the angle of the central incisor, the angles OK1/NA and OK1/FH simultaneously increase or decrease by n degrees.

The correlation of the angles OK1/NA, OK1/FH, UK1/NB, UK1/FH with a number of cephalometric indicators is presented in Table 11.

The angle of inclination of the upper central incisor to the horizontal plane OK1/FH had a positive correlation with OK1/SN. As reported in previous sections due to the characteristic positive value of the angle of inclination of the base of the skull to the horizontal plane SN/FH.

There was a weak unreliable correlation of the UK1/FH angle with the PP/SN angle and the length of the base of the upper jaw (oberkieferlange). The presence of a strong positive relationship between the angles UK1/NB and UK1/MP indicates the presence of their simultaneous and similar changes. The changes in the angles UK1/MP UK1/FH were different, which is confirmed by the presence of a negative correlation between these indicators. The remaining connections of the analyzed angles are given in other sections.

An indicator of the height of the anterior maxillary segment of the lower jaw is the distance UK1-Me. As follows from Table 7, there is a significant gender difference and the average values for men and women were 42.9+0.42 mm, 39.4+0.35 mm, respectively.

The most important of these are the angle of inclination of the lower central incisors relative to the mandibular plane (UK1MP) As can be seen from Table 7, the sex difference between the UK1-MP angle indicator turned out to be unreliable, which made it possible to apply a common indicator for the entire group of subjects. The average UK1-MP angle was 96.1±0.72°. A comparison of the average value with other ethnic groups revealed a very high degree of differences with Mongoloids, i.e. Uzbeks, the lower incisors show a greater vestibular slope relative to the mandibular plane by 6° ($P<0.001$) (Table 3.9).

The noted negative association of SNB with UK1/MP suggests that with anteroposterior rotational movements of the mandible, the lower central incisors, as if compensating for these movements, tend to remain in a certain stable position (Table 11).

It should be noted that all the above angular and linear parameters of the relationship between teeth and jaws are important when considering the issue of changes related to orthodontic treatment.

Interdental parameters

An indicator of the incisor ratio is the inter-incisial angle (intericisialwinkel) formed by the intersection of planes passing through the longitudinal axes of the upper and lower central incisors. The magnitude of the angle in the group of subjects ranged from 1190 to 1520.

The average values of the incisor angle for men and women are shown in Table 8. However, the difference between the average values of the incisor angle for men and women turned out to be unreliable. For cephalometric analysis, a total average value of -133.0+0 can be used,99°.

Table 8

The results of interdental studies in representatives of the Uzbek population, M±m

	Men	Women	Average values	P
overjet	3,2±0,11	3,1±0,08	3,1±0,07	>0,05
overbite	2,7±0,13	3,1±0,12	2,9±0,09	<0,05
interinz.	133,9±1,51	132,1±1,27	133,0±0,99	>0,05

The detected negative correlation of the incisor angle with the angles OK1/NA, UK1/NB, OK1/FH and positive with the angle UK1/FH indicates that a large value of the incisor angle corresponded to the steep position of the upper central incisors, a small incisor angle was accompanied by a flat position (Table 11).

The steep position of the lower central incisor leads to a decrease in the angle of its inclination to the base of the lower jaw, that is, to an increase in the degree of inclination itself. The interdigital angle PP/MP decreases slightly.

It is interesting to note the average relationship between the incision angle and ANB. As a result, it was possible to observe individuals who had the same ANB value with different values of the incisor angle, and vice versa – different ANB angles corresponded to the same incisor angles.

When studying the ratio of the central incisors, in addition to the incisor angle, the depth of incisor overlap (overbite) and sagittal incisor distance (overjet) were considered.

Soft-woven parameters

The thickness of the soft tissues of the profile was determined at the points: forehead, glabella, nasion, subnasale, upper lip, lower lip.

The structural features of the profile of the soft tissues of the face were studied, taking into account thickness, type and gender.

As can be seen from Table 9, the average values of the position of the upper lip in relation to the aesthetic plane of Ricketts OL-E did not reveal significant sexual differences, therefore, when conducting a cephalometric analysis, its average value for all examined patients can be used - 3.8 ± 0.25 mm. The minus sign indicates the posterior position of the upper lip from this plane.

The protrusion of the upper lip of OLprot in relation to (sn-pog') showed significant sex differences. In men, this indicator was 4.5±0.3 mm, in women 3.5±0.25 mm ($P<0.05$). As expected, the OL-E indicator had a strong positive correlation with OL-prot, because by their nature these two parameters are very similar to each other. It should be noted that there is a positive strong relationship with the parameters of the lower lip UL-E, Ulprot and vice versa-the average with Z Anle, Total Chin, UppL, Soft tisPog.Ol-Emm UL-Emm Ulprot.

When studying the position of the lower lip in relation to the aesthetic plane of Ricketts UL-E, no significant sexual difference was found and we consider it advisable to use an average value for both sexes of -2.4±0.27 mm. Also, as in the case of the upper lip, the minus sign indicates the posterior position of the lower lip from the aesthetic plane according to Ricketts.

As can be seen from Table 3.9, when comparing our subjects with other ethnic groups, in particular with Mongoloids and Caucasians, it was revealed that the average values of OL-E mm and UL-E mm of our ethnic group were significantly lower in relation to Mongoloids.

Table 9

The results of soft tissue cephalometric studies

in representatives of the Uzbek population, M±m

	Men	Women	Average	P
Ol-Emm	-3,7±0,42	-3,9±0,29	-3,8±0,25	>0,05
UL-Emm	-2,6±0,44	-2,3±0,32	-2,4±0,27	>0,05
OL prot	4,5±0,30	3,5±0,25	4,0±0,20	<0,01
Ulprot	2,7±0,31	2,5±0,27	2,6±0,21	>0,05
Mentolab	5,9±0,14	4,9±0,16	5,4±0,12	<0,001
Nasolabial angle	97,3±1,42	101,5±1,43	99,4±1,03	<0,05
Z Anle	76,4±1,23	75,7±1,01	76,0±0,79	>0,05
Total Chin	15,6±0,38	13,9±0,24	14,7±0,24	<0,001
UppL	-2,2±0,32	-1,6±0,33	-1,9±0,23	>0,05
LowL	1,6±0,43	1,3±0,40	1,4±0,29	>0,05
Soft tisPog	-8,1±0,81	-7,2±0,68	-7,6±0,53	>0,05

(P<0,001), The Nasolabial angle index of a high degree of statistical reliability is lower compared to Caucasians (P<0,001)..

The degree of protrusion of the UL prot lower lip relative to the line (sn-pog') was 2.7±0.31 mm in men and 2.5±0.27 mm in women. Correlation analysis showed the relative independence of the protrusion of the lower lip from the inclination of the lower incisors in relation to the mandibular plane. However, it showed an average positive relationship with UK1-Apog UK1-NB. The depth of the supramental fold, determined relative to the lower lip, unlike other indicators of the soft-tissue profile, had significant differences between men and women and amounted to 5.9+0.14 mm and 4.9+0.16 mm, respectively.

The Tweed Total Chin indicator is characterized by the distance from the soft-woven Pog point along the perpendicular to the line formed by the NB points. When studying this indicator, significant differences between men and women were revealed, which amounted to 15.6+0.38 mm and 13.9+0.24 mm, respectively.

Thus, the absolute data of linear measurements of the facial skeleton and soft tissues of the face had a significant sex difference. Our group of subjects has a straighter profile, a lower and posteriorly positioned chin, and a significantly greater vestibular slope of the lower incisors to the plane of the lower jaw.

X-ray cephalometric indicators of various ethnic groups Table 3.9

	Uzbeks, M±m		Mongoloids, M±m		Europoids, M±m	
	Male (n=47)	Female (n=49)	Male (n=l9)	Female (n=14)	Male (n=44)	Female (n=81)
NSBa	128,5±0,65	129,2±0,60	129,8±0,32	133,2±1,20*	126,2±0,74*	129,3±0,54
SNmm	69,5±0,40	64,7±0,38	71,1±0,85	68,7±0,69***	78,1±0,55***	71,9±0,41***
SN-FH	5,2±0,21	5,2±0,21	9,7±0,50***	10,3±0,61***	7,0±0,31***	8,0±0,27***
NSAr	123,5±1,43	125,2±0,64	123,5±1,26	125,5±1,36	122,6±0,70	124,5±0,59
SBa	46,7±0,44	43,6±0,35	51,0±0,69***	47,2±0,59***	49,8±0,57***	45,6±0,33*
SNA	82,9±0,53	82,1±0,44	81,3±0,71	81,7±0,83	83,8±0,48	82,6±0,31
NiA	-1,5±0,53	-2,7±0,39	1,0±0,67	2,0±0,72	1,0±0,40	0,52±0,25***
SNB	80,3±0,53	79,6±0,44	79,8±0,62	79,0±0,91	81,64±0,26*	80,0±0,31
NiPOG	-6,6±0,99	-7,9±0,82	0,5±1,28***	0,3±1,71***	-0,43±0,57***	-1,7±0,49***
SNPg	81,6±0,56	80,6±0,47	80,6±0,67	79,6±0,94	82,83±0,42	81,2±0,10
ANB	2,7±0,28	2,6±0,23	1,5±0,41*	2,8±0,75	2,23±0,06	2,52±0,16
WITS	0,09±0,27	-0,4±0,32	1,2±0,58	0,16±0,01	-0,72±0,43	-0,93±0,24
NL-NSL	8,0±0,55	8,6±0,41	10,0±0,67*	10,9±0,61**	6,61±0,45	7,62±0,36
ML-NSL	27,6±0,88	30,3±0,73	33,6±1,17***	35,7±1,71**	28,54±0,72	30,68±0,54
ArGoMe	117,0±1,02	118,5±0,79	122,9±1,24***	124,2±1,76**	119,57±0,86	120,95±0,61*
FHGoMe	24,6±0,77	27,1±0,67	23,8±1,22	25,4±1,63	21,55±0,60**	22,71±0,49***

Continuation

	Uzbeks, M±m		Mongoloids , M±m		Europoids, M±m	
	Male (n=47)	Female (n=49)	Male (n=19)	Female (n=14)	Male (n=44)	Female (n=81)
OK1-NSL	102,3±1,0	101,7±0,81	110,1±1,2***	106,5±0,78***	105,7±0,99***	107,1±0,62***
OKI-NA	19,4±0,90	19,5±0,80	28,8±0,89* **	24,5±1,44**	21,81±0,95	24,55±0,57***
OKl-NAmm	3,5±0,31	4,2±0,28	6,5±0,39***	4,8±0,45	5,04±0,34**	5,26±0,19**
OK1FH	107,6±0,97	106,9±0,78	119,0±1,06***	116,6±1,52***	112,67±0,95***	115,1±0,57***
UKl'Apog	1,8±0,32	2,5±0,25	4,0±0,87*	4,5±0,86*	1,32±0,35	1,79±0,19*
UKbNB	24,1 ±1,04	25,8±0,83	23,7±1,58	24,6±1,58	22,45±1,01	25,59±0,54
UKINBmm	4,6±0,37	4,9±0,29	5,8±0,69	5,7±0,67	4,97±0,34	5,16±0,17
[MPA UK1-ML	96,2±1,01	95,9±1,0	86,9±1,63***	87,3±1,82***	92,27±1,12*	94,88±0,70
overjet	3,2±0,11	3,1±0,08	2,6±0,21*	2,6±0,21*	3,31 ±0,15	3,6±0,10***
overbite	2,7±0,13	3,1±0,12	2,1±0,32	2,5±0,35	2,8±0,19	2,67±0,11**
intcrinz.	133,9±l,51	132,1±1,27	126,0±2,13**	128,3±1,87	133,51±1,63	127,3±0,82**
Ol-Emm	-3,7±0,42	-3,9±0,29	-0,83±0,38***	-0,8±0,44***	-3,1±0,35	-4,2±0,19
UL-Emm	-2,6±0,44	-2,3±0,32	-0,21±0,48***	-0,11±0,45***	-1,7±0,38	-3,2±0,13*
Nasolabial ang.	97,3±1,42	101,5±1,43	93,10±2,39	93,39±2,66**	119,0±1,61***	114,5±1,28***

Note: * - differences regarding the data from the Uzbek group are significant (* - P<0,05, ** P<0,01, *** - P<0,001)

Table 11.

Correlation between the main cephalometric indicators in representatives of the Uzbek population n=96

	GoMe	GoGn	CoB	SNA	NAPog	SNPP	SNMP	NSGn	ArGoMe	FH NPog	SNB	SN OcP	PgNB	ArGn
SN	0,58	-0,23	0,74	-0,04	0,21	-0,10	-0,26	-0,21	0,17	0,09	0,06	-0,20	0,25	0,67
N⊥A	0,28	0,32	0,28	0,83	-0,30	-0,39	-0,28	-0,50	0,00	0,62	0,67	-0,35	-0,15	0,33
SNA	0,23	0,27	0,24	1,0	-0,24	-0,54	-0,41	-0,66	0,00	0,67	0,86	-0,49	-0,09	0,32
SNPog	0,45	0,48	0,42	0,80	0,40	-0,60	-0,68	-0,91	-0,18	0,89	0,98	-0,75	0,33	0,48
N⊥Pog	0,49	0,52	0,42	0,66	0,46	-0,47	0,66	-0,84	-0,24	0,97	0,88	-0,69	0,37	0,50
SNB	0,39	0,42	0,37	0,86	0,26	-0,60	-0,60	-0,87	-0,10	0,86	1,0	-0,69	0,12	0,44
NAPog	0,35	0,35	0,30	-0,24	1,0	-0,14	-0,47	-0,45	-0,29	0,41	0,26	-0,47	0,67	0,30
ANB	-0,28	-0,28	-0,23	0,28	-0,94	0,11	0,35	0,39	0,20	-0,34	-0,26	0,38	-0,38	-0,22
SNPP	-0,23	-0,24	-0,29	-0,54	-0,14	1,00	0,34	0,51	-0,01	-0,49	-0,60	0,59	-0,13	-0,26

PPMP	-0,31	-0,33	-0,13	-0,09	-0,37	-0,25	0,82	0,47	0,71	-0,32	-0,24	0,29	-0,39	-0,20
ArGoMe	-0,51	-0,54	-0,13	0,00	-0,29	-0,01	0,68	0,27	1,0	-0,19	-0,10	0,21	-0,36	-0,13
SNMP	-0,44	-0,47	-0,31	-0,41	-0,47	0,34	1,0	0,77	0,68	-0,61	-0,60	0,65	-0,48	-0,35
NSGn	-0,42	-0,43	-0,28	-0,66	-0,45	0,51	0,77	1,0	0,27	-0,81	-0,87	0,73	-0,33	-0,34
UK1NB	-0,29	-0,31	-0,21	0,24	-0,67	-0,08	0,24	0,23	0,21	-0,28	-0,08	0,14	-0,51	-0,24
OK1NA	0,04	-0,01	0,10	-0,16	0,36	-0,06	0,02	-0,10	0,12	0,06	0,10	-0,28	-0,07	0,08
OK1FH	0,18	0,16	0,25	0,29	0,22	0,02	-0,15	-0,37	0,09	0,42	0,47	-0,46	-0,11	0,26
UK1FH	0,43	0,43	0,15	0,08	0,70	-0,12	-0,34	-0,51	-0,24	0,61	0,42	-0,37	0,49	0,40
UK1NB	-0,29	-0,31	-0,21	0,24	-0,67	-0,08	0,24	0,23	0,21	-0,28	-0,08	0,14	-0,51	-0,24
UK1MP	-0,10	-0,11	-0,12	-0,06	-0,37	-0,06	-0,31	0,00	-0,31	-0,17	-0,06	-0,07	-0,14	-0,14
inter	0,23	0,27	0,12	0,04	0,41	0,07	-0,24	-0,17	-0,25	0,22	0,04	0,00	0,46	0,15
OLE	-0,22	-0,25	-0,13	-0,14	-0,53	-0,04	0,35	0,28	0,26	-0,24	-0,14	0,26	-0,51	-0,09
ULE	0,32	-0,32	-0,22	-0,20	-0,54	-0,01	0,42	0,35	0,27	-0,33	-0,20	0,26	-0,57	-0,15
ULProt	-0,19	-0,19	-0,03	-0,20	-0,38	-0,05	0,38	0,33	0,26	-0,31	-0,15	0,18	-0,46	0,03

Continuation

	N⊥A	N⊥Pog	sna-snp	PPMP	NPog1mm	UK1APog	FHOcc	inter	Post face	overbite	FMPA	NSAr	UK1FH	OK1FH
SN	0,03	0,10	0,54	-0,20	-0,22	-0,18	-0,24	-0,08	0,20	-0,09	-0,28	-0,18	0,20	0,12
N⊥A	1,0	0,60	0,47	-0,06	0,16	0,02	-0,32	-0,09	0,14	-0,11	-0,26	-0,13	0,10	0,26
SNA	0,83	0,66	0,39	-0,09	0,13	0,03	0,31	-0,12	0,19	-0,09	-0,30	-0,35	0,08	0,29
SNPog	0,60	0,92	0,35	-0,32	-0,40	-0,30	-0,61	0,14	0,40	-0,10	-0,59	-0,30	-0,51	0,42
N⊥Pog	0,60	1,0	0,34	-0,38	-0,48	-0,39	-0,71	0,22	0,43	0,00	-0,67	-0,13	0,62	0,43
SNB	0,67	0,88	0,36	-0,24	-0,23	-0,15	-0,53	0,04	0,33	-0,09	-0,50	-0,35	0,42	0,47
NAPog	-0,30	0,46	-0,03	-0,37	-0,82	-0,52	-0,51	0,41	0,36	-0,02	-0,48	0,04	0,70	0,22
ANB	0,32	-0,39	0,07	0,28	0,67	0,34	0,42	-0,30	-0,27	-0,01	0,37	0,00	-0,64	-0,32
SNPP	-0,39	-0,47	-0,28	-0,25	0,06	-0,03	0,44	0,07	0,00	0,01	0,24	0,33	-0,12	-0,26
PPMP	-0,06	-0,38	-0,08	1,0	0,49	0,46	0,32	-0,28	-0,79	-0,13	0,85	-0,10	-0,34	0,02
ArGoMe	0,00	-0,24	-0,08	0,71	0,35	0,30	0,25	-0,25	-0,56	0,13	0,72	-0,08	-0,24	0,09

SNMP	-0,28	-0,66	-0,27	0,82	0,53	0,44	0,58	-0,24	-0,60	-0,10	0,97	0,10	-0,42	-0,15
NSGn	-0,50	-0,84	-0,31	0,47	0,47	0,37	0,60	-0,17	-0,49	-0,04	0,69	0,28	-0,51	-0,37
UK1NB	0,21	-0,28	-0,02	0,26	0,85	0,81	0,21	-0,86	-0,19	-0,04	0,28	-0,18	-0,92	0,22
OK1NA	-0,18	0,07	-0,07	0,08	0,10	0,40	-0,28	-0,60	0,00	-0,22	0,03	-0,18	-0,07	0,87
OK1FH	0,26	0,43	0,14	0,02	0,15	0,38	-0,46	-0,62	0,10	-0,23	-0,14	-0,26	0,01	1,0
UK1FH	0,10	0,62	0,17	-0,34	-0,85	-0,78	-0,44	0,78	0,30	0,03	-0,47	0,09	1,0	0,01
UK1NB	0,21	-0,28	-0,02	0,26	0,85	0,81	0,21	-0,86	-0,19	-0,04	0,28	-0,18	-0,92	-0,22
UK1MP	0,10	-0,14	0,02	-0,31	0,47	0,46	-0,02	-0,62	0,31	0,09	-0,29	-0,09	-0,71	0,10
inter	-0,09	0,22	0,05	-0,28	-0,76	-0,85	-0,06	1,0	0,18	0,16	-0,28	0,23	0,78	-0,62
OLE	0,14	-0,29	0,00	0,37	0,61	0,54	0,28	-0,45	-0,28	0,06	0,36	-0,25	-0,50	0,09
ULE	0,05	-0,36	-0,04	0,43	0,71	0,67	0,27	-0,54	-0,28	-0,02	0,43	-0,26	-0,56	0,16
ULProt	0,00	-0,34	0,11	0,43	0,61	0,64	0,18	-0,54	-0,22	-0,14	0,39	-0,26	-0,48	0,26

Continuation

	OK1 SN	UK1 MP	OK1 NA	UK1 NB	ANB	OL prot	Zangle	Total chin	UppL	Soft tis pog	OLE	ULE	ULprot
SN	0,10	0,01	0,13	0,19	-0,18	0,24	0,10	0,48	-0,17	0,03	0,00	-0,07	0,10
N⊥A	0,28	0,10	-0,18	0,21	0,32	0,14	0,17	-0,03	-0,32	0,28	0,14	0,05	0,00
SNA	0,39	0,15	-0,16	0,24	0,28	-0,01	0,22	-0,05	-0,19	0,30	0,09	0,02	-0,06
SNPog	0,50	-0,09	0,08	-0,19	-0,33	-0,23	0,63	0,24	-0,20	0,69	-0,25	-0,32	-0,30
N⊥Pog	0,43	-0,14	0,07	-0,28	-0,39	-0,27	0,71	0,29	-0,23	0,79	-029	-0,36	-0,34
SNB	0,56	-0,06	0,10	-0,08	-0,26	-0,15	0,52	0,12	-0,23	0,62	-0,14	-0,20	-0,20
NAPog	0,21	-0,37	0,36	-0,67	-0,94	-0,38	0,68	0,46	0,03	0,65	-0,53	-0,54	-0,38
ANB	-0,30	0,40	-0,48	0,60	1,00	0,26	-0,56	-0,32	0,09	-0,60	0,42	0,41	0,25
SNPP	-0,35	-0,06	-0,06	-0,08	0,11	-0,07	-0,23	-0,08	0,26	-0,30	-0,04	-0,01	-0,05
PPMP	0,34	-0,31	0,08	0,26	0,28	0,36	-0,45	-0,31	-0,17	-0,35	0,37	0,43	0,43
ArGoMe	0,11	-0,31	0,12	0,21	0,20	0,22	-0,31	-0,21	-0,06	-0,23	0,26	0,27	0,26
SNMP	-0,20	-0,31	0,02	0,24	0,35	0,32	-0,58	-0,34	-0,01	-0,52	0,35	0,42	0,38

NSGn	-0,45	0,00	-0,10	0,23	0,39	0,30	-0,63	-0,23	0,11	-0,68	0,28	0,35	0,33
UK1NB	0,25	0,77	0,04	1,0	0,60	0,38	-0,54	-0,26	-0,12	-0,40	0,50	0,55	0,46
OK1NA	0,85	0,04	1,0	0,12	-0,48	0,11	0,02	0,16	-0,25	0,25	0,04	0,16	0,30
OK1FH	0,01	0,10	0,87	0,22	-0,32	0,10	0,14	0,15	-0,36	0,41	0,09	0,16	0,26
UK1FH	-0,02	-0,71	-0,07	-0,92	-0,61	-0,39	0,70	0,29	-0,01	0,62	-0,50	-0,56	-0,48
UK1NB	0,25	0,77	0,12	1,0	0,60	0,38	-0,54	-0,26	-0,12	-0,40	0,50	0,55	0,46
UK1MP	0,12	1,0	0,04	0,77	0,40	0,17	-0,28	-0,02	0,01	-0,24	0,26	0,26	0,21
inter	-0,62	-0,62	-0,60	-0,86	-0,30	-0,37	0,46	0,14	0,22	0,23	-0,45	-0,54	0,54
OLE	0,09	0,26	0,04	0,50	0,42	0,80	-0,69	-0,36	-0,52	-0,40	1,0	0,85	0,70
ULE	0,15	0,26	0,16	0,55	0,41	0,70	-0,82	-0,50	-0,42	-0,44	0,85	1,0	0,90
ULProt	0,25	0,21	0,30	0,46	0,25	0,78	-0,73	-0,34	-0,52	-0,32	0,70	0,90	1,0

CONCLUSION

Cephalometric analysis of lateral cephalograms of Uzbek subjects with normal occlusion, aged 17 to 25 years, allowed us to:

1) compile tables of values of various cephalometric indicators for persons of Uzbek nationality with normal bite;
2) to characterize the main cephalometric indicators used in this study;
3) compare some of the indicators we have obtained with similar ones from foreign authors;
4) to analyze the main correlations of cephalometric parameters;
5) Discuss various cephalometric analyses;
6) describe the movements of the gnatic department in the skull and the changes occurring inside the gnatic part due to variability;
7) to speak about the importance of various methods of cephalometric analysis and ways of its widespread implementation in practice.

The average cephalometric data obtained during the analysis of lateral cephalograms can be taken as normal, when evaluating the results of the analysis of the structure of the facial skeleton of patients of the same nationality with jaw abnormalities. Therefore, our data can be used for diagnostic purposes only when examining the maxillofacial system of Uzbeks.

The cephalometric norms of people with ideal occlusion have been developed by many researchers abroad and recommended as standards in the analysis of pathology [235 c.201; 241 c. 492; 242 c.281; 246 c.372; 251 c.296]. We tried to compare the obtained values with data from different authors. Unfortunately, this is not always possible. Since it is necessary to identify ethnic features in the structure of the face and facial skeleton during the comparison, the indispensable conditions for this comparison should be not only the national differences of the studied groups, but also the comparable age, and in some cases the gender of the subjects. This was not always the case in the works known to us, since the main attention of researchers was focused on studying the facial structure of children and adolescents.

The selection of the subjects was not always carried out, but a mixed group was studied, which included persons of different nationalities, but with normal bite, or persons of the same nationality, but with malocclusion and partial loss of teeth. In some cases, statistical processing of the data was not carried out, and when it took place, most often only the value of the quadratic deviation was indicated, without specifying the arithmetic mean and the number of patients examined. And finally, when the deviation from the average value was indicated, it was not noted that it was: "σ" or m". such mathematical processing did not allow for a comparison.

This disadvantage does not affect the Downs data given in the literature review. The author's work says that the results of the study are derived on the basis of measurements of telerentgenograms of 20 children aged 12 to 17 years (the period of constant occlusion), having ideal occlusion and pleasant aesthetic harmony of the profile. The quadratic deviations and fluctuations of the indicators are given.

The derived Downs averages are widely used as standards in many countries of the world, especially in America. We performed statistical processing of some indicators in the period of permanent bite, regardless of the type of face profile, and compared the data obtained with those of Downs.

Of the eight indicators randomly selected by us, determined by his method, three showed statistically significant differences. Our group of subjects has a straighter profile (on average by 3°), a lower and posteriorly positioned chin, and a significantly greater vestibular inclination of the lower incisors to the plane of the lower jaw. These differences call into question the possibility of using Downs standards in the analysis of local material. The average data we have established using the Downs method must be taken into account when diagnosing and drawing up a treatment plan for patients with dental anomalies.

All of the above limits the expediency of using foreign standards, which apparently reflect the ethnic and other characteristics of the surveyed groups.

The data we have obtained confirm the idea that cephalometric analyses are often based on comparing the data obtained from the examination of a particular patient (group of patients) with the average values in this population (for example, Europeans). Therefore, in recent decades, a number of works have appeared in foreign literature devoted to the study of morphometric and cephalometric indicators of the norm for individual ethnic groups and nationalities with their own characteristics [121 c.692; 123 c.135; 124 c.342; 162 c.254; 255 c.132; 256 c.922; 258 c.18-20].

Based on the analysis of cephalograms in ethnic Uzbeks with orthognathic bite and formed dentitions, we obtained the average cephalometric indices of angular and linear measurements.

The data obtained will serve as a basis for judging the deviations of the norm in the facial skeleton and, in particular, in its gnatic department in ethnic Uzbeks. These parameters will be the norm criteria for cephalometric studies in the treatment of patients with dental anomalies. As a result, it facilitates the formulation of a clinical diagnosis, the preparation of a rational plan for orthodontic and surgical treatment and the assessment of their immediate and long-term results.

The results of the cephalometric analysis of representatives of the Uzbek population using the Tweed method are presented when studying the average values of the slope of the lower central incisor in relation to the Frankfurt horizontal and mandibular plane, no significant differences were found between men and women. However, women have a significantly greater angle of inclination of the lower jaw in relation to the Frankfurt horizontal FMA.

The difference in the absolute size of the head and individual organs of the maxillofacial region in men and women was noted even when examining the subjects, when getting acquainted with their cephalograms, as well as when comparing jaw models. As a rule, men had a large skull, a large mass of soft tissues covering the facial skeleton was conspicuous, and men's dental arches were more often larger. As expected, statistical processing of the obtained data revealed a significant significant difference in the main linear measurements for men and women Total Chin, Post Face Ht and Ant Face Ht

The technique of Ch. H. Tweed (1954) consists of the application of a diagnostic triangle of the face formed by the Frankfurt horizontal (FN), the mandibular plane (MP) and the plane of the axis of the lower incisor (LI). The angle formed at the intersection of the Frankfurt horizontal and the mandibular plane is 25° (1); the angle obtained at the intersection of the plane of the axis of the lower incisor and the Frankfurt horizontal is 65° (2); the angle obtained at the intersection of the plane of the axis of the lower incisor and the mandibular plane is 90° (3). The author determined The peculiarity is that the aesthetics and harmony of the face depends on the degree of incline of the lower incisors to the Frankfurt horizontal (2) . When this angle is 65°, the face has a perfect harmonious profile. Thus, in the treatment of occlusion anomalies, in order to improve the aesthetics of the patient's face, it is necessary to adjust the axial tilt of the teeth in order to bring the angle values closer to 65°.

Tweed derived averages are widely used as standards in many countries around the world, especially in America. Unfortunately, we were unable to find a detailed description of the nature and statistical characteristics of the Tweed material, so a statistical comparison is not possible. However, judging by the average data, our group of surveyed has the same characteristics that are listed in the Tweed analysis, but they are less pronounced. Our group of subjects has smaller angles of FMA (on average by 2°) and FMIA (on average by 5°). The lower incisors show a greater vestibular slope relative to the mandibular plane by 6°.

Based on the analysis of cephalograms in ethnic Uzbeks with normal bite and formed dentitions, we obtained the average cephalometric indices of angular and linear measurements.

Reliable information about the structure of the facial skeleton in the analysis of cephalograms is obtained when evaluating angular measurements. This was the reason that we started our research with the study of these quantities. First of all, it was necessary to establish their gender difference. To answer this question, angular measurements were carried out on the trg of 47 men and 49 women. The measurement data have been processed statistically and are shown in the corresponding tables.

For almost all angular parameters, we were unable to identify significant differences in the values of angles in men and women, which is consistent with the data [147 p.15]. Therefore, in this study, when conducting X-ray cephalometric analysis, the separation of the average values of the angles is not divided by gender. Such a division is generally accepted.

To systematize the data obtained, we decided to divide all the cephalometric parameters we examined into the following:

1. Craniometric
2. Maxillary skeletal
3. Mandibular skeletal
4. Interdigital
5. Vertically skeletal
6. Dental alveolar maxillary
7. Dentoalveolar mandibular
8. Interdental ratios
9. Soft-woven

All linear measurements are nothing more than determining the extent of a number of sections of the maxillofacial region between two bounding points or between projections of these points on the nasal plane and the plane of the Frankfurt horizontal. By themselves, the absolute values of linear measurements are not of great value to the researcher, since their range is too wide. In contrast to absolute values, relative values provide more valuable information about the structural features of the facial skeleton.

Craniometric index S-N (the length of the anterior cranial fossa is 69.5±2.8 mm in men, 64.7±2.7 mm in women. The distance between the S-Ba points was equal to: for men - 46.7±3.0 mm, for women - 43.6±2.5 mm. The average values of the distance from the Turkish saddle to the distal border of the articular head of the lower jaw (S-Ar) are equal: for men – 37.8±3.5 mm, for women – 33.4±2.5 mm, the distance between the points Ba-N is 106.2±4 mm and 98.3±4.3 mm, respectively. A high degree of reliability of differences was found in all linear craniometric parameters ($P<0,001$).

A comparison of our subjects with other ethnic groups, in particular with Mongoloids and Caucasians, revealed that the sizes of the craniometric indicators of the SNmm and SBa of our ethnic group were significantly lower.

Correlation analysis revealed that the linear dimensions of the jaws depended on the extent of the anterior cranial fossa. This relationship was positive, that is, the larger S-N distance, as a rule, corresponded to the larger bases of the jaws. This fact suggests that the difference in the linear dimensions of the anterior cranial fossa and the base of the upper and lower jaws is a good diagnostic indicator.

Angular craniometric indicators of the absence of a reliable statistical difference in the sex indices of angular measurements NSBa, the inclination of the base of the skull to the Frankfurt horizontal (SN-FH), NSAr, we propose in clinical practice to use one common indicator -128.9± 0.44°, 5.2±0.15° and 124.4±0.78°, respectively.

A comparison of angular craniometric indicators with those of different ethnic groups showed the presence of a high degree of statistical reliability in NSBa, in relation to Mongoloids.

It should be noted that the difference in the absolute size of the head and individual organs of the maxillofacial region in men and women was noted even when examining the subjects, when getting acquainted with their cephalograms, as well as when comparing jaw models. As a rule, men had a larger skull, a large mass of soft tissues covering the facial skeleton was conspicuous, and men's dental arches were more often larger. As expected, statistical processing of the obtained data revealed a significant significant difference in the main linear measurements in men and women.

It should be noted that during the cephalometric analysis, we tried to make measurements with respect to the FH and SN planes as much as possible. In clinical practice, certain difficulties are created with the outline of the Frankfurt horizontal, since it is not always possible to clearly see the points of Ro and Og on the X-ray. Therefore, today in many university clinics, when conducting cephalometric analysis, preference is given to the SN plane, finding its reference points is not so laborious. In addition, we found that the angle of inclination of the base of the skull to the horizontal plane SN-FH, as a rule, was open anteriorly and had significantly lower values in relation to other ethnic groups. This was the case with all the subjects. Thus, it can be concluded that persons with normal occlusion are characterized by positive values of the angle SN-FH, which gives us reason to use the SN plane if necessary.

The SNA angle, indicating the position of the upper jaw and, in general, the entire maxillary complex relative to the plane of the base of the skull along the sagittal line, i.e. in the anteroposterior direction, is widely used nowadays in almost all cephalometric analyses. This angle is universal for all ethnic groups, which is confirmed by the lack of distinction between the three ethnic groups.

Of particular interest is the measurement method proposed by Ms Namara, which determines the anteroposterior position of the upper jaw in relation to the cranial base. The technique consists in determining the distance between the nasion perpendicular and the point A. The starting plane for this measurement is the Frankfurt horizontal. In men, this indicator was -1.5±0.53 mm, in women -2.7±3.9 mm, but the standard deviation and arithmetic mean error are greater than the average due to strong variation. It was interesting for us to compare this fact with the results of foreign researchers [147 p.12; 180 p.226-228; 238 p.254-256]. The comparison showed the presence of the same trend, that is, the value of the standard deviation was several times higher than the average value, and all the authors agree on the high variability of this indicator. Although this indicator is expressed in millimeters, it is very close to SNA in nature. This is confirmed by a negative reliable relationship between Nasion perpendicular, SNA and NAPog. The interdependence of these angles is explained by the fact that one of their constituent sides, namely the N-A line, is common to both NAPog and SNA. The second and main reason for the change in the SNA angle is the rotation of the gnatic part of the facial skeleton relative to the base of the skull. The proof of this is the negative correlation of SNA, Nasion perpendicular with the angles SN/PP SN/MP NSGn and the lack of connection with the angle of the mandible Ar GoMe. sna-snp

The presence of a positive association – SNA, Nasion perpendicular with SNPog and a negative one –SN/PP confirms the second idea about the reasons for the change in SN/PP values.

Linear measurements showed significant differences in Effective midfacial length (Co-A) and sna-snp, which were 90.1±3.8 mm, 51.9±3.6 mm in men, 82.8±3.5 mm, 47.8±3.1 mm in women, respectively ($P<0.001$).

The anterior facial angle for the mandible (SNB) characterizes the mesio-distal position of the anterior part of the apical base of the mandible in relation to the base of the skull, its average value was 79.21°±2.82°.

The length of the mandible body (Go-Me), like other linear measurements, had sex differences, in men this indicator was 80.3 ± 0.53 mm, in women 79.6±0.44 mm.

The anteroposterior position of the mandible in relation to the cranial base is determined by the distance between the nasion perpendicular and the Pog point in mm. The starting plane for this measurement is the Frankfurt horizontal. Since no significant difference in typical indicators was found, its average value for all patients can be applied - 7.2±0.64 mm. A comparison of the obtained indicator with the values of different ethnic groups revealed the presence of a significant difference in relation to Caucasians and Mongoloids, which indicates the presence of a tendency to a more posterior chin position in our ethnic group. It was not unexpected to find a strong positive correlation between the SNPog FHNPog Nasion perpendicular parameters and the Pog, SNB point. Evidence of the displacement of the gnatic part of the facial skeleton relative to the plane of the base of the skull is the presence of an inverse relationship between the Nasion perpendicular to the point Pog, SNB and SNPP, SNMP, and the absence of a reliable relationship between SNPog FHNPog. Changes in the latter have little effect on the value of –NAPog as a result of simultaneous rotational displacement of the entire gnatic department. The weak connection between the above-mentioned angles gave us reason not to divide the subjects into groups depending on the position of the anterior part of the lower apical base in the skull.

The facts arguing for the rotational displacement of the jaws include the pronounced average negative relationship of SNB with SN/OccP and the absence of its dependence on the angles of PgNB.

In the study of cephalograms, there was no relationship between the SNB and the angle of the lower jaw ArGoMe.

In addition to the SNB indicator, the SNPog and NSGn angles perform a similar function. The first one duplicates the SNB to a certain extent. They differ only in one starting point. The SNPog angle demonstrates the antero–posterior position of the most prominent point of the chin – pogonion -in relation to the plane of the base of the skull, and also serves as a characteristic of the severity of the chin segment of the lower jaw. To do this, it is enough to use two craniometric indicators -the SNB and SNPog angles. The difference between the angles of SNB and SNPog, or in other words PogNB, shows the degree of protrusion of the chin in relation to the nasion point, or rather the degree of steepness of the front surface of the chin. Moreover, the relationship between this degree and the magnitude of the angle is direct.

The angles NSGn, SNPog, as well as the degree of inclination of the mandible to the base of the skull and SNB give the most complete picture of the position of the mandible in the skull.

The measurement of the effective mandibular thickness (Co-Gn) and the distance between the Ar-Gn points revealed significant differences, which amounted to 120.4±5.7 mm, 113.2±5.6 mm in men, 110.7±4.0 mm, 103.7±4.3 mm in women, respectively.

The index of the length of the mandible branch (Post Face by Tweed) the distance between the Ar-Go points in men was 54.9±3.6 mm, in women 48.5±3.96 mm.

It is impossible to exclude a change in the angle of the SNB due to an increase in the size of the jaws themselves, as evidenced by the presence of a positive correlation between SNB GoMe, Co-B, Ar-Gn.

The anteroposterior relationship of the apical bases of the upper and lower jaw relative to the nasion point represents the angle ANB, it is considered positive if the point “A” is located in front of “B”.

With the inverse ratio of points, the ANB value is taken with a minus sign. If the points N, A, B are on the same straight line, the basal angle is zero. The second way to determine the value of the ANB angle is SNA-SNB=ANB. The typical ANB indicators differed significantly from each other and were correspondingly equal to the degree of convexity of the facial skeleton.

ANB depended on N⊥A and had a weak negative relationship with N⊥Pog. The first is probably explained by the varying degree of development of the anterior part of the upper basal arch, the variability of which has already been noted. This version is supported by the weak dependence of ANB on the length of the base of the upper jaw, lower jaw and angles SN/PP, PP/MP.

The influence of ANB on the relationship of the central incisors with the bases of the jaws of the same name and the incisor angle is highlighted in the gnathometric section of the analysis.

The flat position of the lower central incisors, and consequently the distal displacement of the anterior border of the lower basal arch, contributes to an increase in ANB.

The steep position is accompanied by small ANB angle values. These conclusions are confirmed by the presence of a positive average correlation of the basal angle with the angles Npog 1mm, UK1-Apog

Wits-number is a parameter characterizing the relative position of the apical bases of the jaws in the anteroposterior direction relative to the occlusal plane.

As mentioned earlier, vertical problems can be determined by the gonial angle, the angle of the mandibular plane, the ratio of the anterior and posterior facial height.

O.D.I. is one of the objective indicators of the vertical relationship of the jaws. To determine the ODI, the sum of the angles is calculated: 1–the angle formed between the Palatinal plane (PP) and the Frankfurt horizontal (FH), 2 – the angle between the Anterior facial plane (AB plane) and the mandibular plane (MP). Since no significant gender difference was found, we consider it advisable to use its average value for both sexes-75,21°±2,82°.

The shift of indicators in a smaller direction, relative to the average value, indicates a tendency to a skeletal open bite, in a larger direction – to a deep one.

In the treatment of anomalies, the index of sagittal jaw relationship APDI is widely used. To determine which the sum of three angles is calculated: 1–the front angle (FH-NPog), 2–the angle A-B of the plane c NPog, 3-formed between the palatinal plane (PP) and the Frankfurt horizontal (FH). The average APDI value in the examination of patients of both sexes is 81.4±3.79°. A lower value indicates distal occlusion or a tendency to Class II, a higher value indicates mesial occlusion or a tendency to Class S. With this measurement, differential diagnosis can be performed when planning treatment.

Ant face displays the distance formed by drawing the line perpendicular to the point Me from the PP plane.

The direct indicators of the inclination of the gnatic department to the plane of the base of the skull are angles, SN-PP, SN-OccP, SN-MP. The sex differences between the SN-OccP angle indices turned out to be unreliable. This allows you to apply a common indicator for the entire group of subjects. The average SN-OccP angle was 14.8±0.36°.

When considering the average typical values of SN-MP angles, a significant decrease was revealed in men compared with women, which amounted to 27.6±0.88° in men and 30.3±0.73° in women, respectively.

It was not possible to find a significant difference between the Bjork sum of angles (SNAr+ArGoMe+SArGo) for men and women, so we can apply the average figure common to the subjects, which was 387.50±6.90.

The horizontal position of the gnatic department is characterized by the following indicators:

1) The angle of inclination of the occlusal plane to the horizontal (Frankfurt) plane OcP-FH.
2) The angle of inclination of the base of the lower jaw to the horizontal (Frankfurt) plane MP-FH.

The angle of inclination of the occlusal plane to the horizontal plane of the OcP-FH, as a rule, was open in front. This was observed in all the subjects. Thus, it can be concluded that persons with normal bite are characterized by positive values of the angle of inclination of the upper jaw to the horizontal plane. It was not possible to detect a significant difference between men and women, so we can apply the average figure common to the subjects, which was 9.6± 0.34.

When considering the angle of inclination of the base of the mandible to the horizontal plane FH-MP, a significant decrease was revealed in men compared with women, which amounted to 24.6±0.77° in men and 27.1±0.67° in women, respectively.

It should be noted that there is a significant positive correlation between the angles PP/SN and MP/SN OccP/SN FH/MP FH/OccP. Consideration of the correlation of these indicators does not cast doubt on the version proved in the previous sections about the rotational displacement of the gnatic part of the facial skeleton.

The vertical interjaw relationship is characterized by an angle formed by the intersection of the planes of the bases of the upper (PP) and lower jaw (MP). The average values obtained did not differ significantly between men and women. Therefore, you can use the general average figure of 20.8+0.55°.

In the analysis of the inter-jaw relations, a significant positive correlation of the inter-jaw angle with the BJORK angle was found. Therefore, it can be concluded that the more developed the lower half of the face, the greater the magnitude of the jaw angle. It was also noted that with an increase in the maxillary angle, the angle of the lower jaw increases. This is proved by the average positive correlation between them.

Above, when analyzing the inter-jaw relations, it was pointed out that there is a weak feedback between the PP/MP angles and the interstitial angle. That is, different interdigital angles can correspond to the same incisor angles and vice versa.

Based on the above, it can be concluded that the maxillary angle (PP-MP) is an indicator of the development of the jaw bodies, alveolar processes and dental arches in the anterior part of the lower face.

The angle of the mandible is formed by the intersection of the plane of the ascending branch of the mandible (Ah) with the plane of its base (MP). The magnitude of this angle in the study group ranged from 102.10 to 136.10. From these average values, depending on gender, it follows that no significant inter-gender differences were found, therefore, we can use the general average figure of 117.8°+0.64°.

The relationship of the angle of the mandible with a number of cephalometric indicators shows the presence of a negative average correlation with the length of the body of the mandible, the height of its branch and relative independence from the depth of the incisor overlap.

It is interesting to note that the value of the mandibular angle is influenced by the orientation of the mandible in the skull and the mandibular angle. The angle of the lower jaw increases when the lower jaw body acquires a steeper position, which is confirmed by the presence of a positive average correlation with its angles SN/MP and FH/MP.

The study of the NSGn angle showed that one common indicator of 67.30+0.370 can be used, since no significant difference was found between men and women. It does not depend on changes in the NSAr distance and has a weak negative correlation with the S-Ar distance. The absence of dependence on changes in the S-Ar distance speaks against the possibility of a rectilinear anteroposterior displacement of the lower jaw, which is one of the proofs of rotation of the gnatic part of the skull.

The vertical orientation of the central incisors is indicated by the angle of inclination OK1NA° and the distance from the cutting edge of the central incisors to the vertical nasal plane OK1NA mm and OK1NPog mm.

The angle formed by the axial line along the upper central incisor and the vertical nasal plane (NA) was 19.4+6.2° for men and 19.5+5.6° for women. The millimeter values of this measurement of the distance from the cutting edge of the upper incisor to the vertical nasal plane of NA and NPog were 3.5+2.1 mm in men, 5.6+3.8 mm in women 4.2+1.9 mm, 6.3+2.5 mm, respectively. However, these figures have a huge spread due to the strong variation. A comparison with the results of foreign researchers showed the presence of the same trend and all authors agree on the high variability of this indicator [147, 180, 238].

The horizontal position of the upper central incisors in space is represented by the angle of inclination of the upper central incisors to the horizontal (Frankfurt) OK1-FH. The results of the study did not show significant sex differences, so you can use one average value for all examined -106.8+5.5°.

The indicator of the inclination of the upper central incisor to the plane of the base of the skull is the angle OK1-SN. The sex differences between the OK1-SN angle indicator turned out to be unreliable. This allows you to apply a common indicator for the entire group of subjects. The average OK1-SN angle was 102,3±6,9°.

The vertical orientation of the lower central incisors is indicated by the angle of inclination UK1NB° and the distance from the cutting edge of the central incisors to the vertical nasal plane UK1NB mm and UK1NPog mm.

The angle formed by the axial line along the lower central incisor and the vertical nasal plane (NB) was 24.0+7.1° in men and 25.8+5.9° in women. The millimeter values of this measurement of the distance from the cutting edge of the upper incisor to the vertical nasal plane NB and NPog were 4.6+2.6 mm in men, 2.7+3.6 mm in women 4.9+2.1 mm, 3.5+2.5 mm, respectively. However, these figures have a huge spread due to the strong variation. A comparison with the results of foreign researchers showed the presence of the same trend and all the authors agree on the high variability of this indicator [147 c.12; 180 c.226; 238 c.255].

The horizontal position of the lower central incisors in space can be judged by the values of the angle of inclination of the upper central incisors to the horizontal (Frankfurt) UK1-FH. Also, as in the case of the upper central incisor, the results of the study did not show significant sex differences, so you can use one average value for all the examined 60.2+7,5°.

A negative correlation was noted between the angles UK1/NB and UK1/FH, similar to the relationship between the vertical and horizontal angular landmarks of the jaws and the occlusal plane. The relationship between the angles OK1/NA and OK1/FH is positive, because when the hypotenuse (in this case, the plane of the central upper incisors) rotates around the vertex of the angle of the central incisor, there is a simultaneous increase or decrease in the angles OK1/NA and OK1/FH by n degrees.

The angle of inclination of the upper central incisor to the horizontal plane

OK1/FH had a positive correlation with OK1/SN. As reported in previous sections due to the characteristic positive value of the angle of inclination of the base of the skull to the horizontal plane SN/FH.

There was a weak unreliable correlation of the UK1/FH angle with the PP/SN angle and the length of the base of the upper jaw (sna-snp). The presence of a strong positive relationship between the angles UK1/NB and UK1/MP indicates the presence of their simultaneous and similar changes. The changes in the angles UK1/MP UK1/FH were heterogeneous, which is confirmed by the presence of a negative correlation between these indicators. The remaining connections of the analyzed angles are given in other sections.

An indicator of the height of the anterior maxillary segment of the lower jaw is the distance UK1-Me. There is a significant gender difference and the average values for men and women were 42.9+2.9 mm, 39.4+2.5 mm, respectively.

The most important of them is the angle of inclination of the lower central incisors relative to the mandibular plane (UK1MP). The sex difference between the UK1-MP angle indicator turned out to be unreliable, which allows us to apply a common indicator for the entire group of subjects. The average UK1-MP angle was 96.0±7.1°.

The noted negative association of SNB with UK1/MP suggests that with anteroposterior rotational movements of the mandible, the lower central incisors, as if compensating for these movements, tend to remain in a certain stable position.

It should be noted that all the above angular and linear parameters of the relationship between teeth and jaws are important when considering changes related to orthodontic treatment.

An indicator of the incisor ratio is the inter-incisial angle (intericisialwinkel) formed by the intersection of planes passing through the longitudinal axes of the upper and lower central incisors. The magnitude of the angle in the group of subjects ranged from 1190 to 1520.

However, the difference between the average values of the incisor angle in men and women turned out to be unreliable. For cephalometric analysis, a common average value can be used -133,92 ±1,88^0.

The detected negative correlation of the incisor angle with the angles OK1/NA, UK1/NB, OK1/FH and positive with the angle UK1/FH indicates that the large values of the incisor angle corresponded to the steep position of the upper central incisors, the small incisor angle was accompanied by its flat position.

The steep position of the lower central incisor leads to a decrease in the angle of inclination to the base of the lower jaw, that is, to an increase in the degree of inclination itself. The interdigital angle PP/MP decreases slightly.

It is interesting to note the average relationship between the incision angle and ANB. We were able to observe this result in individuals who had the same ANB value at different incision angles, and vice versa – different ANB angles corresponded to the same incision angle.

When studying the ratio of the central incisors, in addition to the incisor angle, the depth of incisor overlap (overbite) and sagittal incisor distance (overjet) were considered.

Due to the lack of a noticeable connection between the condition of soft tissues and the type of facial profile, the general group of orthognathies is considered. The thickness of the soft tissues of the profile was determined at the points: forehead, glabella, nasion, subnasale, upper lip, lower lip.

The average values of the position of the upper lip in relation to the aesthetic plane of Ricketts OL-E did not reveal significant sexual differences, therefore, when conducting a cephalometric analysis, its average value for all examined patients can be used - 3.8± 0.25 mm. The minus sign indicates the posterior position of the upper lip from this plane.

The protrusion of the upper lip OL prot in relation to (sn-pog') showed significant sex differences. In men, this indicator was 4.5±0.3 mm, in women 3.5±0.25 mm ($P<0.05$). As expected, the OL-E indicator had a strong positive correlation with OL-prot, because by their nature these two parameters are very similar to each other. It should be noted that there is a positive strong relationship with the parameters of the lower lip UL-E, Ulprot and vice versa-the average with Z Anle, Total Chin, UppL, Soft tisPog.Ol-Emm UL-Emm Ulprot.

When studying the position of the lower lip in relation to the aesthetic plane of Ricketts UL-E, no significant sexual difference was found, therefore, we consider it advisable to use an average value for both sexes of -2.4±0.27 mm. Also, as in the case of the upper lip, the minus sign indicates the posterior position of the lower lip from the aesthetic plane according to Ricketts.

The degree of protrusion of the UL prot lower lip relative to the line (sn-pog') was 2.7±2.1 mm in men and 2.5±2.9 mm in women. Correlation analysis showed the relative independence of the protrusion of the lower lip from the inclination of the lower incisors in relation to the mandibular plane. However, it showed an average positive relationship with UK1-Apog UK1-NB

The depth of the supramental fold, determined relative to the lower lip, unlike other indicators of the soft-tissue profile, had significant differences between men and women and amounted to 5.9+1.0 mm and 4.9+1.1 mm, respectively.

The Tweed Total Chin indicator is characterized by the distance from the soft-woven Pog point along the perpendicular to the line formed by the NB points. When studying this indicator, significant differences between men and women were revealed, which amounted to 15.6+2.6 mm and 13.9+2.7mm, respectively.

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