

**THE MEANING OF TELERADIOGRAPHIC INDICATORS IN THE COMPREHENSIVE THERAPY OF DENTAL PATIENTS (LITERATURE REVIEW)****Poltava State Medical University (Poltava, Ukraine)****dmitrenko25@ukr.net**

*The strategy of modern treatment of dental patients is based on a comprehensive clinical examination, scientific analysis, and interpretation of the obtained data of additional methods of examination. The article presents an analysis of scientific sources on the role of teleradiographic indicators in identifying individual morphological features of the facial skeleton, establishing the shape of dental anomalies, and general planning of the volume of orthodontic movements. Due to the study of lateral teleradiograms of the condition of the cervical vertebrae C2, C3, C4, note the stage of bone maturity and its correspondence to chronological age. The focus of orthodontic treatment on the growth potential of the jaws increases the possibility of non-extraction treatment. Of great practical importance for the diagnosis and effective correction of dental anomalies are scientific studies of domestic scientists who have established in Ukrainian boys and girls with orthognathic occlusion of the percentile range of teleradiographic parameters, built regression models of craniofacial structures characterizing the location of lower teeth and the profile of the soft tissues of the face and created on their basis diagnostic computer programs. Professional clinical decisions to justify the use of different types of orthodontic appliances, the choice between treatment with or without removal of teeth should also be based on understanding and determining the stage of growth of the jaws and taking into account individual standards of teleradiography.*

**Key words:** teleradiography, cephalometric analysis, dental patients, malocclusion.

**Relationship of the publication with planned research works.** The work is a fragment of the research topic: "Interdisciplinary approach to the diagnosis, prevention and treatment of patients with dental anomalies and deformations", state registration number 0118u004343.

**Introduction.** In Ukraine and around the world, children and adults have a high frequency of dental anomalies (DA), which reaches 84.33% during the period of permanent occlusion [1]. It is known that in recent years there has been an increase in demand for orthodontic care, and among the contingent of dental patients with occlusal disorders predominate young people aged 15 to 23 years.

Today, computer technology has become an integral part of everyday life in orthodontics, as well as in surgical, orthopedic and therapeutic dentistry. The era of high-tech digital methods of diagnosis, treatment planning and forecasting the results of rehabilitation of dental patients is confidently entering the practice of physicians and are no longer just appropriate, but also essential tools to ensure a high level of professionalism. Dental rehabilitation is impossible without knowledge of the aesthetics, function and morphology of the dental area of the individual in general and in particular the

choice of treatment depends on the features of the facial skeleton [2, 3].

X-ray examination methods are an integral part of the diagnosis of dental patients. They are mandatory to clarify the etiopathogenetic aspects, diagnostic criteria, planning orthodontic treatment, forecasting and monitoring its results. An important method of diagnosing maxillofacial anomalies is cephalometric studies, which are based on the method of teleradiography (TRG). Using a TRG in maxillofacial orthopedics and orthodontics, in particular, allows to obtain an image that best matches the actual size of the head and its bone structures, their relative position, allows to obtain not only important qualitative but also quantitative morphometric indicators [4, 5].

Despite a large number of cephalometric studies of foreign and domestic scientists on this issue, research in this area is relevant and appropriate to provide an even more individual approach to the choice of method and scope of treatment.

**The aim of the study** is to analyze and summarize information about the role of teleradiography indicators in the complex treatment of dental patients.

**Main part.** Modern requirements prefer TRG – research in the differential diagnosis of dental-alveolar and skeletal forms of the DA, decision-making on a treatment plan, control of stages, end result and determining its prognosis. Due to the use of the lateral TRG method, it is possible to detect craniometric, gnathometric and profilometric disorders in distal, mesial, open, deep occlusions, based on the average data [2, 3, 4].

The most modern orthodontic systems are now considered to be individualized bracket systems. With the help of the Insignia complex digital planning of orthodontic result is carried out individually, calculate optimal indicators of angulation and brackets torque, and form arches. An innovative approach to treatment requires consideration in the diagnosis of options for the normal structure of the skull, determining the type of face, and identifying individual deviations of the inclinations of the teeth [3, 5].

Most researchers are unanimous in their opinion that the most effective and, most importantly, stable correction of the position of the teeth is achieved in patients who underwent orthodontic treatment during the period of intensive growth of the jaws. Research on lateral TRG as an additional radiological method in orthodontics of cervical vertebrae stages formation allows predicting the size of potential growth of jaws. Skeletal maturity is studied in 6 stages of bone age in size and shape of the second (C2), third (C3) and fourth (C4) cervical vertebrae. In the first stage (growth initiation), active growth is just beginning, and the apogee of jaw growth will occur in 1.5-2 years, so orthodontic treatment should be aimed at eliminating the factors that lead to the development of DA and functional disorder.

ders. This stage is preparatory for further interventions to actively correct the direction of jaw growth. In the second stage comes the most convenient time for active treatment with a tendency to correct the growth of the jaws, with a displacement of the lower jaw. The third stage of maturity of the cervical vertebrae is the most favorable moment to obtain an effective treatment result with stimulation or growth retardation of the jaws. In the fourth stage of bone age, it is recommended to move the teeth with the possibility of expanding the jaws. Moving the lower jaw in the fifth stage of maturity is not effective because it leads to a "double" bite. It is recommended to plan complex maxillofacial operations for cranial and gnathic forms of the DA when detecting the sixth stage according to the indications [6, 7].

The most informative angular parameters that characterize the type of structure of the facial skeleton: the incline of the skull base: N-S-AR, N-S-BA; intermaxillary angle NL / ML; the inclination of the upper jaw to the base of the skull NSL / NL, the inclination of the lower jaw to the base of the skull NSL / ML, the angle of the lower jaw Go. A neutral type of facial skeleton structure, which is determined by a balanced face with harmonious muscles, was found in only 13.04% of patients. The horizontal type of the structure of the facial skeleton, which is characterized by a decrease in the angles of the planes of the mandible and intermaxillary angle, was determined in almost half of those examined (47.83%). At neutral and horizontal types of jaws growth, the forecast of congestion treatment without removal of teeth is favorable. Quite often observe the vertical type of facial skeletal structure (39.13%). It is characterized by an increased angle of inclination of the mandibular plane, which contributes to the development of alveolar insufficiency and complicates the treatment of crowded teeth. The vertical type of structure of the facial skeleton to eliminate the accumulation of teeth in a permanent bite at the end of the active growth of the jaws prefers techniques with the removal of individual teeth [6].

A comparison of the obtained data revealed statistically significant differences in the ratio of the bases of the upper (SM) and lower jaws (PG). In Engle's class I occlusion pathology, the ratio of the bases of the upper (SM) and lower jaws (PG) approached the norm (2:3), which indicated a balanced mutual arrangement of the jaws and their apical bases. Engle's pathologies of occlusion of the 2nd and 3rd classes revealed deviations from the norm in the position of the jaws and alveolar processes in the sagittal plane. In distal occlusion, it was due to prognathism of the upper jaw or its alveolar process, and in mesial occlusion – prognathism of the lower jaw or its alveolar process.

Positive statistically significant ( $p < 0.05$ ) correlations were found between the following angular parameters: the plane of the upper jaw and the inclination of the lower jaw to the base of the skull ( $r = 0.69$ ;  $p < 0.001$ ); intermaxillary angle and plane of the upper jaw ( $r = 0.67$ ;  $p < 0.001$ ); intermaxillary angle and inclination of the lower jaw to the base of the skull; ( $r = 0.50$ ;  $p < 0.04$ ); intermaxillary angle and mandibular angle ( $r = 0.49$ ;  $p < 0.04$ ). A significant inverse correlation was found between the beta angle and the intermaxillary angle ( $r = -0.71$ ;  $p < 0.001$ ) [6].

Changes in the sagittal and vertical parameters of the TRG in various occlusal pathologies affect the out-

come of dento-alveolar compensation. In case of continued growth of the jaws, it is advisable to combine treatment with modification of the growth of the jaws with the help of intermaxillary devices. Upon completion of active growth, the vertical type of facial skeletal structure limits the possibility of non-extraction treatment [7].

In deciding on the choice of extraction method of treatment of crowded teeth, the most important are the following parameters of TRG: linear – the distance from the cutting edge of the upper and lower incisors to the A-Pog plane, angular – the inclination of the central incisors of the upper and lower jaws relative to the occlusal plane and upper and lower jaws, respectively [8].

Determination of appropriate telerradiographic indicators for early diagnosis and further correction of pathological changes of the dental apparatus, which takes into account the age, sex, profile, and type of the patients face, meets modern requirements in dental practice when the doctor needs to determine the most individualized and the amount of medical care [9-13].

Significant achievements of domestic dentists in the definition and modeling of cephalometric indicators characteristic of the population of Ukraine with orthognathic occlusion. Studies [14, 15, 16] studied the features of telerradiographic indicators of Ukrainians, as well as built mathematical regression models in Ukrainian boys and girls with orthognathic occlusion with different types of the normal facial profile according to Schwarz. In the works of Marchenko A.V. and others. [17, 18] in adolescents with physiological occlusion on computed tomograms showed indicators of tooth length, their mesiodistal, parietal-lingual dimensions, differences in these indicators between persons of different sexes, and different cranotypes. It has been proved [18] that the metric indicators of dental arches in boys are larger than in girls, and the size of dental arches between boys or girls with mesocephalic and brachycephalic do not differ significantly.

Dmitriev M.O. used the method of lateral telerradiography for Ukrainian boys and girls with orthognathic occlusion normative cephalometric parameters according to several leading authors' methods of analysis: Steiner, Schmuth, Downs. In research [19-23], young Ukrainian residents with orthognathic occlusion found connections between the main cranial parameters and the parameters of the upper and lower jaws and the relationship between the location of the teeth of the upper and lower jaws and the soft tissue profile of the face; the relationship between the angular values of the upper and lower jaws and the location of the teeth and the profile of the soft tissues of the face; correlations of linear parameters of the upper jaw with the characteristics of the occlusal plane, indicators of the location of the teeth and the profile of the soft tissues of the face; correlations between angular intermaxillary and tooth positioning and facial soft tissue profile. Significant correlations were found in adolescents of different sexes between linear parameters of the mandible and indicators characterizing the location of teeth and facial soft tissue profile and between linear intermaxillary indicators and occlusal plane indicators, tooth location indicators, facial soft tissue profile indicators.

Chernysh A.V., Gunas I.V., and others. [24, 25] used the method of step-by-step regression analysis to de-

termine the appropriate individual cephalometric parameters in Ukrainian boys and girls by the methods of Harvold, Burstone, and Ricketts.

**Conclusions.** Thus, modern personalized dentistry provides a high-quality diagnostic process with the determination of teleradiographic indicators depending on racial, ethnic, population, gender, and other group characteristics of the studied patients, both normal and with certain anomalies. Improving the effectiveness of comprehensive treatment of dental patients can be

achieved through an interdisciplinary approach, thorough, detailed identification of etiological factors, and differentiated choice of methods and treatments to determine the potential of youth growth and taking into account individual standards of teleradiography.

**Prospects for further research.** The teleradiographic indicators recommended for use in practical dentistry will promote a more accurate and early diagnosis of pathological deviations of these parameters and control the dynamics of the effectiveness of their correction.

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### ЗНАЧЕННЯ ТЕЛЕРЕНТГЕНОГРАФІЧНИХ ПОКАЗНИКІВ У КОМПЛЕКСНОМУ ЛІКУВАННІ СТОМАТОЛОГІЧНИХ ПАЦІЄНТІВ (ОГЛЯД ЛІТЕРАТУРИ)

**Смаглюк Л. В., Дмитренко М. І., Гуржій О. В., Нестеренко О. М., Воронкова Г. В.**

**Резюме.** Епоха високотехнічних цифрових методів діагностики, планування лікування і прогнозування результатів реабілітації стоматологічних пацієнтів впевнено входить в практику лікаря і вже є не просто доцільними, а і вкрай необхідними засобами забезпечення високого рівня професіоналізму. У статті проведений є аналіз та узагальнення відомостей про роль телерентгенографічних показників у комплексному лікуванні стоматологічних пацієнтів. Вказується на той факт, що сучасна персоніфікована стоматологія передбачає якісний діагностичний процес із визначенням телерентгенографічних показників в залежності від расових, етнічних, популяційних, статевих та інших групових особливостей досліджуваних пацієнтів, як у нормі, так і при певних

аномаліях. Дослідження на бічних телерентгенограмах, як додатковому рентгенологічному методі в ортодонції, стадій формування шийних хребців дозволяє прогнозувати величину потенційного росту щелеп. Розширення аналізу бічних телерентгенограм за рахунок оцінювання форми шийних хребців не потребує традиційного проведення рентгенограми кисті і дає змогу підвищити своєчасність та якість ортодонтичного лікування. Зміни сагітальних і вертикальних параметрів телерентгенограм при різних патологіях прикусу впливають на результат проведеної денто-альвеолярної компенсації. У випадку продовження росту щелеп доцільно поєднувати лікування з модифікацією росту щелеп за допомогою апаратів міжщелепної дії. По завершенні активного росту вертикальний тип будови лицевого скелета обмежує можливість безекстракційного лікування. Наведені вагомі здобутки вітчизняних вчених стоматологів у визначенні та моделюванні цефалометричних показників, характерних для населення України з ортогнатичним прикусом.

Підвищення ефективності комплексного лікування стоматологічних пацієнтів можна досягти за рахунок міждисциплінарного підходу, ґрунтовного, детального виявлення етіологічних чинників і диференційованого вибору методів і засобів лікування з визначенням потенціалу юнацького росту і врахуванням індивідуальних норм телерентгенографічних показників.

**Ключові слова:** телерентгенографія, цефалометричний аналіз, стоматологічні пацієнти, зубощелепні аномалії.

### THE MEANING OF TELERADIOGRAPHIC INDICATORS IN THE COMPREHENSIVE THERAPY OF DENTAL PATIENTS (LITERATURE REVIEW)

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**Abstract.** The era of high-tech digital methods of diagnostics, treatment planning and predicting rehabilitation outcomes in dental patients is confidently entering the practice of doctoring and is not just reasonable but extremely necessary means of ensuring a high level of professionalism.

The article analyses and summarizes the information about the role of teleradiographic indicators in the comprehensive therapy of dental patients. It demonstrates the fact that modern personalized dentistry provides quality diagnostic process with teleradiographic indicator determination depending on racial, ethnic, population, gender and other group characteristics of the examined patients both normal and with certain level of abnormality. The lateral teleradiographic examination, as an additional radiographic method in orthodontics, of stages of cervical vertebrae formation allows to predict the size of the potential jaw growth. Lateral teleradiography analysis expansion by means of cervical vertebrae shape evaluation does not require traditional hand-wrist radiographs and allows to increase timeliness and quality of the orthodontic treatment. Sagittal and vertical parameter changes of teleradiographs in case of occlusal disease influence the result of the conducted dentoalveolar compensation. With continuing jaw growth, it is reasonable to combine the treatment with jaw growth modification by applying intermaxillary device. Upon completion of the active growth period, vertical type of facial skeleton structure limits the ability of nonextraction treatment. The article represents the significant Ukrainian dental scientists' contributions to detection of and modelling cephalometric indices typical for the population of Ukraine with orthognathic bite.

Efficiency gain of the comprehensive treatment in dental patients can be reached through interdisciplinary approach, thorough, detailed identification of etiological factors and differentiated choice of methods and means of treatment with the youth growth potential determination and consideration of individual rates of teleradiographic indicators.

**Key words:** teleradiography, cephalometric analysis, dental patients, malocclusion.

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#### Conflict of interest:

The authors confirm that there is no conflict of interest in this article.

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A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article.

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