

## НАУКОВІ ОГЛЯДИ

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# FEATURES AND MODERN ASPECTS OF THE USE OF TELEROENTGENOGRAPHIC INDICATORS DETERMINED BY STEINER, RICKETTS AND DOWNS METHODS (ANALYSIS OF SCIENTIFIC LITERATURE)

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**Annotation.** *The aim of the work is to analyze the modern scientific literature on the features and use of methods of cephalometric analysis of lateral teleroentgenograms by Steiner, Ricketts and Downs methods. The introduction of modern methods of dental care, which include an individual approach to the patient depending on the characteristics of his face is the most promising in clinical medicine. However, at the same time, such an approach requires a solid theoretical basis, foundation, and further large-scale clinical trials. Clinical anthropology, one of the parts of which is cephalometry, meets such requirements most fully. Cephalometry, in turn, is reflected in clinical application in the form of cephalometric analysis, which is a key element to begin providing modern dental care to the population.*

**Keywords:** *teleroentgenography, Steiner, Ricketts, Downs methods.*

Since its inception, the teleroentgenography method has been inextricably linked with cephalometric analysis, as a lateral X-ray of the head can detect abnormalities in the development of the dental and maxillofacial system and assess the location of bone and soft tissue formations, and by standard head fixation treatment progress.

Methods of cephalometric analysis differ from each other due to the use of different anatomical formations and the lines, angles and planes formed by them. One of the first methods proposed by Downs W. B. in 1948 [6], Steiner C. S. in 1953 [26] and Ricketts R. M. in 1961 [24]. These methods have become widespread among physicians and are of great interest for clinical trials in all parts of the world [4, 15, 18].

The aim of the work is to analyze the modern scientific literature on the features and use of methods of cephalometric analysis of lateral teleroentgenograms by Steiner, Ricketts and Downs.

Pakistani researchers performed a cephalometric analysis by Steiner of 100 radiographs of middle-aged men and women who had no previous orthodontic treatment and had a balanced cranial-facial profile. The analysis of the data revealed a significant difference in the indicators between men and women (except for the indicators GO.GN-SN, OP-SN and ANB). Compared to the norm, Pakistani youth had a more posterior position of the upper and lower jaws relative to the base of the skull and a greater inclination of the incisors [13].

Rathore A. S. and co-authors [23] compared cephalometric parameters for Meravi children living in Rajasthan with normative indicators according to the Steiner method. The sample in the experiment was 100 people (50 boys and 50 girls aged 11-13 years). It was found that in children of Meravi ethnicity, in contrast to the normative indicators, there is a retrusion of the lower jaw

relative to the base of the skull, a more convex face and a less pronounced chin.

Peculiarities of indicators according to the method of Steiner cephalometric analysis for Moroccans were determined. The study was performed with the participation of 71 people aged about 22 years (24 men and 47 women) who had no history of orthodontic treatment. The biggest differences revealed during the study were: greater skeletal sagittal mismatch, labial inclination of the crowns of the lower incisors, the assigned position of the bases of the upper and lower jaws [20].

Mohammad H. A. and others [17] established the features of Steiner's cephalometric parameters for the population of Malaysia. 60 ethnic Malaysians were selected for the study. The statistical analysis revealed that in Malaysians the upper and lower jaws are located more to the front, more protruding upper and lower lips and less protruding chin.

Sharma J. N. [25] found differences in cephalometric parameters according to Steiner's analysis between the Mongoloid and Aryan populations of Nepal. In addition, differences were found between the figures obtained for the population of Nepal and the normative data of Steiner.

Korean researchers in the development of norms of cephalometric indicators by the Ricketts method selected 31 adolescents aged 9-19 years, who were observed for 10 years. The analysis of the results showed that no significant difference was found in comparison with the normative data. Thus, the researchers concluded that for the treatment of adolescents of Korean nationality can be used normative indicators of the Ricketts method [3].

There was also no significant difference between Ricketts data and Latin American Peruvians, but sexual dimorphism was found in men and women with different inter-molar width, width and height of the nose, width of the

upper jaw, lower jaw and face [21] and in another study, the same group of researchers based on the obtained material developed regression models to determine the gender of this group of people for the needs of forensic dentistry [22].

At the same time, Chinese scientists have found that the normative indicators for Ricketts differ from those obtained by them in a study of residents of Harbin and Shanghai. Moreover, the rates of Harbin and Shanghai residents also differ according to the Ricketts method [27].

Csiki I. and co-authors [5] investigated whether it is possible to use the normative indicators of the Ricketts method for the population of Hungary. The result of the analysis of teleroentgenograms of 500 children showed that all indicators except the angle of the mandible did not differ significantly from the norm.

Al-Jasser N. M. [1] identified the features of cephalometric parameters for the population of Saudi Arabia according to the methods of Downs and Steiner. For the study, 60 people (30 men and 30 women) aged 20-30 years who had no history of orthodontic treatment were selected. Significant differences were found in comparison with the normative indicators, namely - residents of Saudi Arabia, greater protrusion of the upper jaw, the tendency to Class II type of face and higher values of the angle of the mandibular plane.

A similar type of study, but only on a male sample, was performed by another group of Saudi scientists. They also compared the results of other nationalities, namely Kuwaitis, Turks and Australians. Of the 18 studied parameters by the Ricketts method, 12 differences with normative indicators, 5 differences with the indicators of the population of Kuwait and 3 with the population of Turkey were found [14].

In a survey of 112 teleroentgenograms of ethnic Bangladeshis using the Downs cephalometric analysis method, the researchers found that Bangladeshis had higher AV plane, mandibular, Y-axis, and lower facial and inter-incisal angles than in the norm data [11].

Zheng Y. and Che F. [29] identified and compared Downs cephalometric parameters in Koreans living in China and the ethnic population of the Republic of Korea. There was a significant difference in facial angle value - it was greater in Chinese Korean men ( $p < 0.05$ ).

Xu P. P. and co-authors [28] determined differences in cephalometric parameters according to the Downs analysis between residents of Shi and Han nationalities in Zhejiang Province (China). MP-FH and U1-L1 were higher in Shi ( $p < 0.05$ ), while facial convexity was lower ( $p < 0.05$ ).

Jasim F. Y. and Al-Dawood A. [12] conducted a teleroentgenographic study followed by cephalometric analysis by Downs of 108 adolescents aged 12-15 years in the city of Musul (Iraq). In comparison with the normative indicators, it was found that Iraqis have higher indicators of the angle of convexity of the face, the angle of the mandibular plane and the angle of the occlusive plane.

Significant differences were also found according to

the Steiner, Tweed, Ricketts and McNamara methods for the Marat ethnic group in India [2] and according to the Ricketts, Steiner, Tweed and Arnett methods for the Mexican population [7].

In recent years, domestic scientists have been actively conducting research to adapt regulatory indicators of various methods of cephalometric analysis for the Ukrainian population. Thus, in one of the works, 6 reliable regression models used in the analysis of cephalometric parameters by Charles J. Burstone were constructed and analyzed [8].

In another study, normative cephalometric parameters for boys and girls of the Podillia region of Ukraine were determined by the method of J. McNamara. The results of the analysis of the obtained data allowed to establish significant differences between the indicators of J. McNamara and those obtained during the work, as well as the peculiarities of the manifestation of sexual dimorphism in the studied group of persons [10].

In addition, it should be noted that conducting such studies on the population of certain regions, as in the above study is fully justified, because, as established by a group of domestic researchers [9], in different regions of Ukraine there are some differences in the distribution of craniotype and type face, although in general the population of Ukraine is quite homogeneous in anthropometric composition.

Thus, a group of researchers led by Orlovsky V. O. [19] analyzed and built regression models of premolar sizes depending on the cephalometric parameters of men from different regions of Ukraine. Thus, statistical analysis showed that in most cases, regardless of administrative-territorial affiliation, for premolars of the upper jaw in the model most often included indicators of mesio-distal size of the crown and neck of the tooth and for premolars of the mandible - the height of tooth crowns.

Marchenko A. and co-authors [16] conducted a study on 77 boys and girls of different craniotypes, residents of the Podillia region of Ukraine, and identified features of computed tomography characteristics of incisor roots and canines in individuals of a certain craniotype and manifestations of sexual dimorphism.

Thus, it becomes clear that not only the ethnic or regional affiliation of a person but also the characteristics of the craniotype and type of face are factors that must be considered when adapting cephalometric techniques for a particular country or region.

## Conclusions and prospects for further development

1. A review of the literature has shown that cephalometric analysis of lateral teleroentgenograms has become an integral tool of clinical dentistry. Domestic and foreign researchers have done extensive work to improve the use of cephalometric analysis by various authors, including Steiner, Ricketts and Downs - conducted studies that consider the gender and ethnicity of the person, which significantly improves the accuracy of the method.

However, there are still almost no data on works in which these methods of cephalometric analysis were corrected according to different types of faces in humans,

which in turn requires further appropriate research performed on the Ukrainian population.

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#### **ОСОБЛИВОСТІ ТА СУЧАСНІ АСПЕКТИ ВИКОРИСТАННЯ ТЕЛЕРЕНТГЕНОГРАФІЧНИХ ПОКАЗНИКІВ, ВИЗНАЧЕНИХ ЗА МЕТОДАМИ STEINER, RICKETTS І DOWNS (АНАЛІЗ НАУКОВОЇ ЛІТЕРАТУРИ)**

**Драчевська І. Ю.**

**Анотація.** Мета роботи - провести аналіз сучасної наукової літератури щодо особливостей та використання методів цефалометричного аналізу бокових телерентгенограм за Steiner, Ricketts і Downs. Впровадження сучасних методик надання стоматологічної допомоги, що включають у себе індивідуальний підхід до пацієнта залежно від особливостей його обличчя є найбільш перспективним з точки зору клінічної медицини. Проте, водночас, такий підхід вимагає міцної теоретичної бази, фундаменту та подальших широкомасштабних клінічних досліджень. Найбільш повно таким вимогам відповідає клінічна антропологія, однією з частин якої є цефалометрія. Цефалометрія, в свою чергу, знайшла своє відображення в клінічному застосуванні у вигляді цефалометричного аналізу, який є ключовим елементом для початку провадження надання сучасної стоматологічної допомоги населенню.

**Ключові слова:** телерентгенографія, методи Steiner, Ricketts, Downs.

#### **ОСОБЕННОСТИ И СОВРЕМЕННЫЕ АСПЕКТЫ ИСПОЛЬЗОВАНИЯ ТЕЛЕРЕНТГЕНОГРАФИЧЕСКИХ ПОКАЗАТЕЛЕЙ, ОПРЕДЕЛЕННЫХ МЕТОДАМИ STEINER, RICKETTS И DOWNS (АНАЛИЗ НАУЧНОЙ ЛИТЕРАТУРЫ)**

**Драчевская И. Ю.**

**Аннотация.** Цель работы - провести анализ современной научной литературы об особенностях и использовании методов цефалометрического анализа боковых телерентгенограмм по Steiner, Ricketts и Downs. Внедрение современных методик оказания стоматологической помощи, включающие в себя индивидуальный подход к пациенту в зависимости от особенностей его лица, является наиболее перспективным с точки зрения клинической медицины. Однако в то же время такой подход требует прочной теоретической базы, фундамента и дальнейших широкомасштабных клинических исследований. Наиболее полно таким требованиям соответствует клиническая антропология, одной из частей которой есть цефалометрия. Цефалометрия, в свою очередь, нашла свое отражение в клиническом применении в виде цефалометрического анализа, который является ключевым элементом для начала предоставления современной стоматологической помощи населению.

**Ключевые слова:** телерентгенография, методы Steiner, Ricketts, Downs.