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FEATURES OF TELEROENTGENOGRAPHIC INDICES DETERMINED BY THE METHODS OF BJORK, SASSOUNI, JARABAK AND KIM (SCIENTIFIC LITERATURE ANALYSIS)

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Anotation. *The purpose of this work is to analyze the current scientific literature on the features and use of cephalometric analysis methods of lateral teleroentgenograms by Bjork, Sassouni, Jarabak and Kim methods. The analysis is based on a review of current literary sources for 2010-2019, using scientometric databases eLIBRARY.RU, PubMed and Web of Science. An analysis of the literature on Bjork, Sassouni, Jarabak and Kim methods indicates that in order to effectively introduce them into the practice of orthodontists in Ukraine, it is necessary to determine the characteristics of teleroentgenographic indices for each of them for the local population, considering age and gender.*

Keywords: *teleroentgenography, methods of Bjork, Sassouni, Jarabak and Kim.*

Cephalometry is called the process of examination and measurement of the head, which is carried out using a variety of instrumental research methods, in particular, such as radiography. The clinical application of cephalometry knowledge is cephalometric analysis, which is used in such fields as dentistry and oral and maxillofacial surgery where cephalometric guidelines assist physicians in planning orthodontic intervention. Cephalometric analysis has become an integral part not only in modern treatment but also in scientific research [1, 2, 10, 11, 12, 15, 18, 26].

The rapid development of dentistry and scientific thought in the twentieth century led to the emergence of a large number of methods of cephalometric analysis, each of which has its advantages and disadvantages. In this regard, orthodontists usually use several methods of cephalometric analysis at the same time in their work [1, 2, 3, 20, 21].

However, the basis of all methods of analysis is the basic instrumental method of research - teleroentgenography. Teleroentgenography is an X-ray of the head in its standardized position, made perpendicular to the sagittal plane of the patient.

In Ukraine, studies on the methods of cephalometric analysis of lateral radiographs are still of limited character. Articles [10, 11, 12] present the results of determining normative teleroentgenographic indices by Charles J. Burstone, Tweed, and J. McNamara methods for certain age groups of the population of Ukraine and considering gender.

This area of research is extremely promising and requires continued research, considering other known methods of cephalometric analysis of lateral teleroentgenograms, such as Bjork, Sassouni, Jarabak and Kim.

The purpose of our study is to analyze the current scientific literature on the features and use of cephalometric analysis methods for lateral teleroentgenograms by Bjork, Sassouni, Jarabak and Kim.

The Bjork analysis technique was developed in 1947 on the basis of a study of 281 recruits and 322 boys of Swedish

nationality and includes 7 structural features indicating the type of rotation of the mandible and 5 angles forming the frontal polygon [6].

The Jarabak technique dates back to 1972 and interprets how craniofacial growth can affect the condition of teeth before and after treatment. Jarabak's analysis is based on 5 points: Nasion (Na), Articulare (Ar), Menton (Me), Go (Goonion) and Sella (S). Together, they also form a polygon on the face when joined by lines. The above points are used to study the anterior or posterior aspect ratio, which in turn allows one to predict the growth of structures in the lower half of the face [14].

Both techniques have been widely used in studies of both theoretical and clinical nature. In one study, a Bjork analysis was performed to compare teleroentgenographic indexes in two twins, one of whom suffered from acromegaly. The twin with the disease revealed an anterior displacement of both the upper and lower jaw, with displacement of the lower jaw more pronounced, which caused the mandibular prognathism. An increase in the size of the body of the mandible, the coronary process and the growth of the mandible were also found [9].

122 adolescents of about 18 years of age, of Polish nationality, were subjected to a teleroentgenographic study with subsequent cephalometric analysis using the Bjork method, with subsequent comparisons with Bjork A. regulatory data to identify specific indicators for the Polish population. The conducted study revealed a small number of statistically significant differences [18].

A similar nature of the study was conducted to identify the features of teleroentgenographic indices of the population of Pakistan. Men and women aged 18-25 years without tooth-jaw abnormalities and a history of dental surgery participated in the experiment. Statistical processing of the obtained data revealed that only the PFH/AFH ratio was different from the Bjork A. data. No gender differences were detected in the studied parameters [20].

At the same time, when compared with Jarabak data, other Pakistani research groups [15, 21], a significant difference of the articular angle, upper and lower gonial angles and anterior angle ($p < 0.001$) was found in men and a significant difference in the indicators of upper and lower gonial angles, anterior and posterior base of the skull, height of the body of the mandible, height of the front and back of the face ($p < 0.001$) in women living in Pakistan compared to Jarabak J. R. data.

Jahjah Y. and Ahmad S. [13] used the Jarabak method to study the spatial and positional symmetry between left and right mandibular growths, their possible asymmetry in adults without radiographic and clinical symptoms of temporomandibular disorders.

Alam M. K. et al. [1] analyzed 100 standardized lateral teleroentgenograms of 50 women and 50 men aged 20 years, ethnic Bangladeshi, with no history of dental treatment and no abnormalities or deformities of the facial skull using Jarabak and Bjork methods. Statistical analysis of the data revealed significant differences from the normative indicators of these methods; men have significantly higher mandibular body length, saddle angle, articular angle, gonial angle, SNA, SNB, L1 to mandible angle, inter-incisor angle, and anterior face height than women.

A similar study was conducted by scientists in Saudi Arabia in 2018 [2] at King Khalid University. Between April and September 2017, 100 individuals between the ages of 17 and 22 were selected by researchers to perform a radiographic study using Jarabak and Bjork methods. The analysis of the data revealed significant differences for the people of Saudi Arabia, namely, as for men and women revealed a significant difference in the length of the front and back of the skull base ($p < 0.05$), height of the front and back of the face, body height and length of the mandible. Expressed manifestations of sexual dimorphism have been established.

Mangla R. et al. [22] investigated mandibular morphology in different face types using different parameters, including the Jarabak method. The experiment involved 110 individuals who were divided into subgroups according to the Jarabak method: normodivergent, hypodivergent, and hyperdivergent. The data analysis found that the lower jaw with a vertical growth pattern was associated with greater symphysis height, lower depth of the lower jaw, decreased height and width of the mandible branch, an increase in the angle of the lower jaw branch and a gonial angle as opposed to the lower jaw with horizontal growth pattern.

Rodríguez-Cerdas Y. A. et al. [24, 25] evaluated the effect of Jarabak and Bjork cephalometric analysis components on the face profile of 90 adults with different facial types: straight, convex and concave face profiles. The S.Ar.Go angle was found to be significantly different between all groups ($p = 0.005$). Individuals with a convex face profile had significantly greater joint angle values compared to a concave face profile (149.67+6.85 vs. 143.72+6.01). Other indicators were similar between groups.

Separate works aim to investigate age-specific features

of teleroentgenographic indices. Thus, Torlakovic L. and F?r?vig E. [29], when performing cephalometric analysis by Bjork, found that significant changes occurred in the profile of soft tissues from the second to fourth decades. The aging of the male face profile begins 10 years later than that of women, however, they are of greater magnitude.

A group of Chinese researchers found that the most significant changes in cephalometric parameters (according to the methods of Bjork, Jacobson, Pancherz, and McNamara) when comparing persons in the age group of 10-14 years occur in persons aged 12 years [30].

Also, worth considering is the Sassouni method developed in 1955. The author of the method states that four planes - suborbital, palatal, occlusal plane and mandibular plane [27] should meet in a well-proportioned face at point O (located at the back of the skull).

Scolozzi P. et al. [28] in 2011 retrospectively performed the evaluation and accuracy of the Sassouni method (what the authors call this method "divine proportion") in the treatment of teeth-jaw deformities. Analysis of the results of the study revealed that the "divine proportion" of the face can only be predicted using a specific cephalometric analysis in the lower third of the face, and such parameters as the age and gender of the person must be considered.

Another study compared the methods of cephalometric analysis by Sassouni and Delaire, since both do not consider dental performance [3]. The study was conducted on 20 surgical cases. Analysis of the data revealed that the Sassouni method showed better results with forward movement of the upper jaw and with vertical modifications. The VSP photos obtained by Sassouni analysis were more balanced than when Delaire analysis was performed (16.4/14 = +2.6).

A group of Indian scientists have identified features of teleroentgenographic indices for Maharashtra residents according to the Sassouni cephalometric analysis method [8].

The "youngest" among the above methods of cephalometric analysis is the Kim method proposed by Young H. Kim in 1987 for a treatment known as MEAW Therapy [4, 5].

The team of researchers found the effectiveness of ODI and APDI cephalometric analysis of Kim in determining the vertical and sagittal models of Latin Americans [7]. Statistical data processing has shown that these indicators are highly reliable and can be effectively applied to the Latin American population.

In addition, there is a separate group of studies that indicate the effectiveness of the use of the method of cephalometric analysis by Kim and MEAW Therapy in various pathologies of the tooth-jaw system [16, 19, 23, 31].

Conclusions and prospects for further development

An analysis of the literature on Bjork, Sassouni, Jarabak and Kim techniques indicates that in order to effectively

introduce them into the practice of orthodontists in Ukraine, it is necessary to determine the characteristics of

telerontgenographic indices for each of them for the local population, considering age and gender.

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ОСОБЛИВОСТІ ТЕЛЕРЕНТГЕНОГРАФІЧНИХ ПОКАЗНИКІВ, ВИЗНАЧЕНИХ ЗА МЕТОДАМИ BJORK, SASSOUNI, JARABAK І KIM (АНАЛІЗ НАУКОВОЇ ЛІТЕРАТУРИ)

Ваховський В. В.

Анотація. Мета роботи - провести аналіз сучасної наукової літератури щодо особливостей та використання методів цефалометричного аналізу бокових телерентгенограм за Bjork, Sassouni, Jarabak та Kim. Аналіз проведено на основі огляду сучасних літературних джерел за 2010-2019 роки, користуючись наукометричними базами eLIBRARY.RU, PubMed і Web of Science. Аналіз літературних джерел щодо методик Bjork, Sassouni, Jarabak та Kim вказує на те, що для ефективного їх впровадження в практику ортодонтів в Україні, необхідно визначити особливості телерентгенографічних показників щодо кожної з них для місцевого населення з урахуванням віку та гендерної належності.

Ключові слова: телерентгенографія, методи Bjork, Sassouni, Jarabak і Kim.

ОСОБЕННОСТИ ТЕЛЕРЕНТГЕНОГРАФИЧЕСКИХ ПОКАЗАТЕЛЕЙ, ОПРЕДЕЛЕННЫХ МЕТОДАМИ BJORK, SASSOUNI, JARABAK И KIM (АНАЛИЗ НАУЧНОЙ ЛИТЕРАТУРЫ)

Ваховский В. В.

Аннотация. Цель работы - провести анализ современной научной литературы об особенностях и использовании методов цефалометрического анализа боковых телерентгенограмм по Bjork, Sassouni, Jarabak и Kim. Анализ проведен на основе обзора современных литературных источников за 2010-2019 годы, пользуясь наукометрическими базами eLIBRARY.RU, PubMed и Web of Science. Анализ литературных источников по методикам Bjork, Sassouni, Jarabak и Kim указывает на то, что для эффективного их внедрения в практику ортодонтов в Украине, необходимо определить особенности телерентгенографических показателей по каждой из них для местного населения с учетом возраста и гендерной принадлежности.

Ключевые слова: телерентгенография, методы Bjork, Sassouni, Jarabak и Kim.
