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FEATURES OF USING INDIVIDUALIZED STANDARD VALUES FOR THE INCISORS' POSITIONS ACCORDING TO C. STEINER IN UKRAINIAN YOUNG MEN AND GIRLS

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The purpose of the study is to investigate the correctness of the use of the recommended indexes of the position of the central incisors according to S. Stainer for Ukrainian young men and women with orthognathic bite. Cephalometric analysis was performed using OnyxCeph 3D pro, statistical analysis, construction of polynomial and regression models was performed in MS Excell and "Statistica 6.0". Analysis of the distribution of angular and linear indices of the position of the central incisors in Ukrainian young men and women revealed significant variability with respect to the ANB angle. Therefore, to perform more accurate diagnosis and treatment planning for individual human characteristics for Ukrainian young men and women in the diagnostic cephalometric method S. Stainer it is recommended to use the developed prognostic models for determining the linear and angular indicators of the position of the central incisors of the upper and lower jaw.

Key words: central incisors, C. Stainer cephalometric analysis, Ukrainian young men and girls.

The position of the frontal dental group is one of the most important factors that are considered when planning and evaluating the quality of dental interventions, whether prosthetics or orthodontic treatment. According to one of the recent Ukrainian study the prevalence of malocclusion in permanent dentition reaches an average of 84.33% [3]. The largest number of patients' complaints occurs with complaints about the non-aesthetic position of the frontal group of teeth or their exposure. To be able to plan treatment and evaluate the situation objectively, the physician must have clear geometric orientations of the position of the incisors of the upper and lower jaws relative to other facial structures. Historically, pioneers of orthodontic diagnostics have been offered various diagnostic approaches and given average indicative normative characteristics that were optimal from the perspective of researchers [11]. Over time, studies began to emerge that refined the mean values, considering racial, ethnic and gender characteristics [2, 6, 8, 9].

One of the most common and popular diagnostic methods preferred by orthodontists [6] is the analysis of lateral teleroentgenograms by S. Stainer, that also allows determining in detail the spatial position of incisors. But also many studies indicate the presence of ethnic and gender characteristics of Steiner indicators [4, 5, 12, 13].

The aim of the study – to investigate the correctness of the use of the recommended indicators of the position of the central incisors according to the data obtained by S. Stainer for Ukrainian young men and women with orthognathic bite.

Materials and methods. Using the Veraviewepocs 3D device Morita (Japan), for 38 young men (17 to 21 years of age) and 55 girls (16 to 20 years of age) with physiological occlusion, as close as possible to orthognathic, obtained and analyzed lateral teleroentgenograms according to C. Steiner method [11] (fig. 1-2).
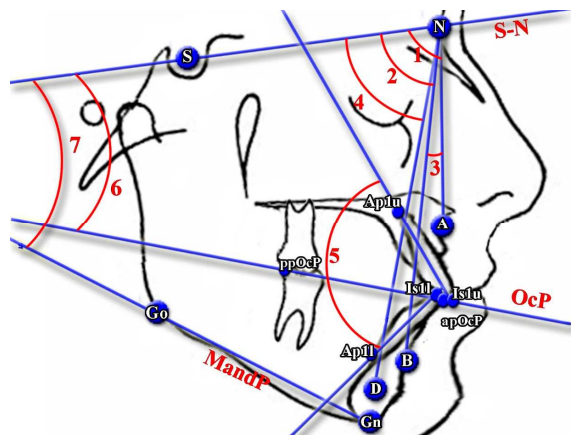

Fig. 1. Cephalometric indicators by C. Steiner: 1 – angle SNA; 2 – angle SNB; 3 – angle ANB; 4 – angle SND; 5 – inter-incisor angle II; 6 – angle SN-OcP; 7 – angle SN-GoGn.
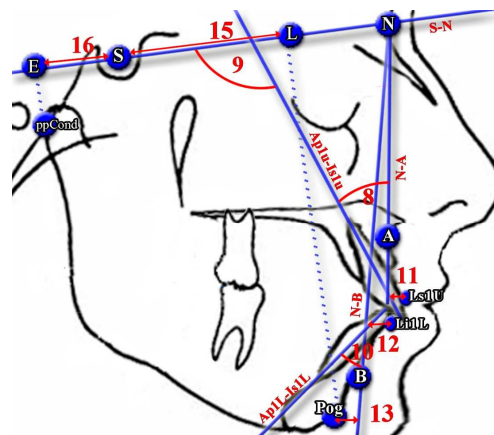

Fig. 2. Cephalometric indicators by C. Steiner: 8 – angle Max1-NA; 9 – angle Max1-SN; 10 – angle Mand1-NB; 11 – distance 1u-NA; 12 – distance 1l-NB; 13 – distance Pog-NB; 14 – Holdaway ratio, the difference between distances 1l-NB (12) and Pog-NB (13); 15 – distance S-L; 16 – distance S-E.

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For convenience of demonstration, as well as the simplest method of approximation, the trend line, which in our case was a 6-degree polynomial function that describes the dependency and estimates the degree of approximation, we used MS Excel. Construction of regression models was carried out in the package "Statistica 6.0".

Results of the study and their discussion. The position of the frontal dental group is one of the most important factors to consider when planning and evaluating the quality of dental interventions. To be able to plan treatment and evaluate the situation objectively, the physician must have clear geometric orientations of the position of the incisors of the upper and lower jaws relative to other facial structures.

One of the most common and popular diagnostic methods for determining the spatial position of incisors is the analysis of lateral teleroentgenograms by S. Stainer, which in addition to the mean standard values, gave individualized standard values depending on the values of the ANB angle. In the diagram proposed by S. Stainer, the axes of the upper and lower incisors are symbolically indicated by the lines and the angular and linear values for each indicator are represented. For the upper incisor, the values for angle Max1-Na (left) and distance 1u-Na (right) for the lower incisor angle Mand1-NB (left) and distance 1l-NB (right) (fig. 3) are indicated at the top.
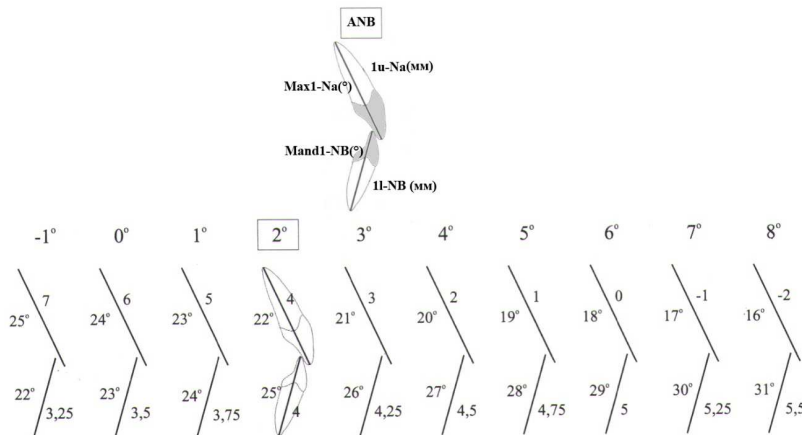

Fig. 3. Individualized standard incisors position values suggested by C. Stainer [10].

In the course of the study, we analyzed the distribution of position values of the upper central incisors relative to the NA line – Max1-Na angle, 1u-Na distance, and the lower central incisors relative to the NB line – Mand1-NB angle, and 1l-NB distance in 93 Ukrainian young men and women with physiological bite that is as close as possible to the orthognathic. The obtained data are graphically represented in the form of graphs showing the distribution of the corresponding indexes of the position of the incisors (y-axis), depending on the values of the angle ANB (x-axis) (fig. 4a-4b).

Fig. 4a. Distribution of values of indexes of position of the central incisors of the upper and lower jaws (Max1-Na, 1u-Na, Mand1-NB and 1l-NB) in Ukrainian young men with orthognathic occlusion depending on the values of the ANB angle. Notes: here and hereafter: R^2 – coefficient of determination; y – the value of the relevant index.
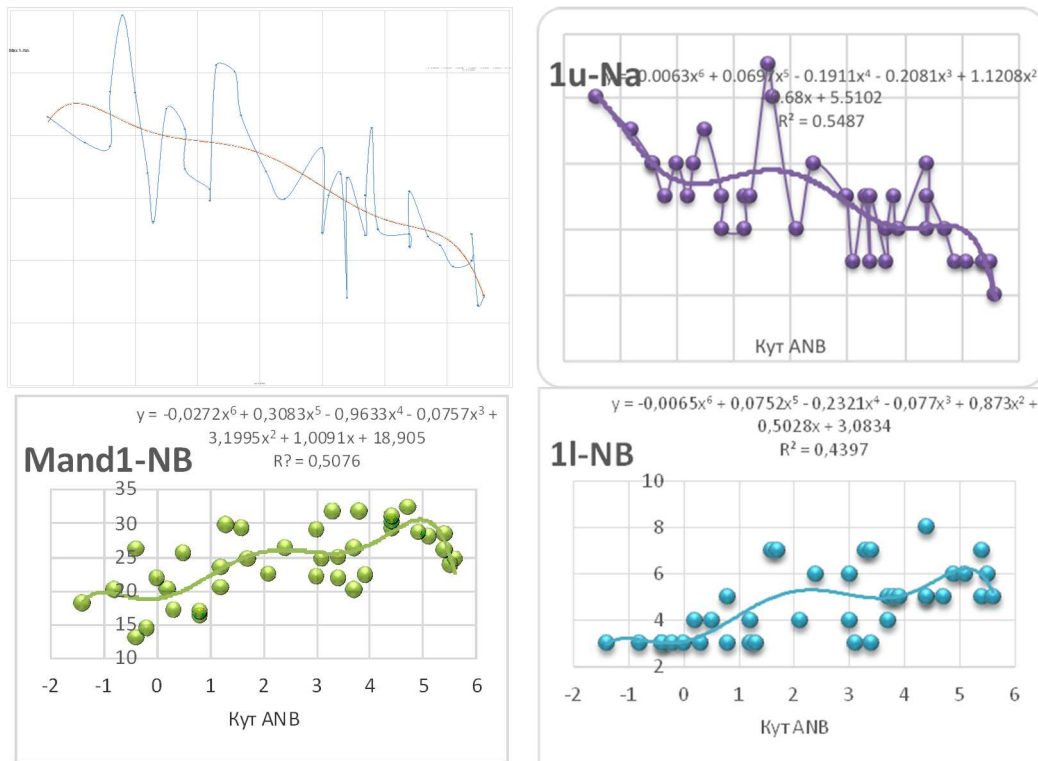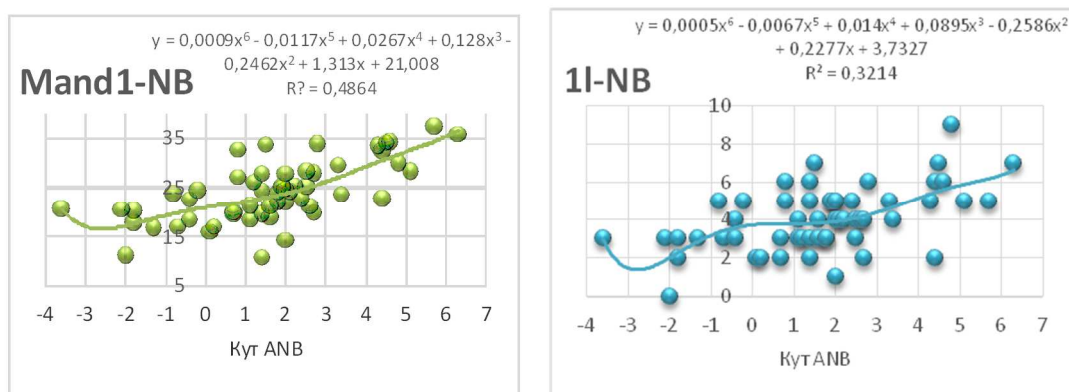
Fig. 4b. Distribution of values of indexes of the position of the central incisors of the upper and lower jaws (Max1-Na, 1u-Na, Mand1-NB and 1l-NB) and the corresponding polynomial functions of their values depending on the values of the angle ANB for Ukrainian young women with orthognathic bite.

The graphs obtained show significant fluctuations in indicators that are difficult to clearly identify characteristic group values. However, the available trend lines show some dependence that can be mathematically determined either by a polynomial function, which for maximum accuracy must have the maximum acceptable number of orders, or by applying regression analysis, which may also consider the influence of other indicators of the S. Stainer methodology.

For comparison, we constructed sixth-order polynomial functions (having an approximation value of 0.32-0.58) and regression functions (an approximation reliability value of 0.46-0.77) of the indexes of the position of the central incisors of the upper and lower jaw for Ukrainian young men and women (table 1). As it can be seen from table 1, the use of direct stepwise regression analysis has increased the level of prediction of natural diagnostic values of the position of the central incisors of the upper and lower jaw for Ukrainian young men and girls.

Table 1

Polynomial and regression functions of indexes of position of central incisors of upper and lower jaw for Ukrainian young men and women.

Indexes	Polynomial functions	Regression functions
For young men		
Max1-NA	$= -0.013x^6 + 0.157x^5 - 0.586x^4 + 0.439x^3 + 0.919x^2 - 2.081x + 25.72$ ($R^2 = 0.585$)	$= 30.73 - 1.791*ANB - 0.399*SN\text{-}OCP$ ($R^2 = 0.706$)
1u-Na	$= -0.006x^6 + 0.070x^5 - 0.191x^4 - 0.208x^3 + 1.121x^2 - 0.680x + 5.510$ ($R^2 = 0.549$)	$= -4.396 - 0.486*ANB + 0.167*SE + 0.084*SL + 0.086*SN\text{-}GOGN$ ($R^2 = 0.768$)
Mand1-NB	$= -0.027x^6 + 0.308x^5 - 0.963x^4 - 0.076x^3 + 3.199x^2 + 1.009x + 18.91$ ($R^2 = 0.508$)	$= 26.90 + 1.548*ANB - 0.363*SN\text{-}OCP - 0.621*POG\text{-}NB$ ($R^2 = 0.542$)
1l-NB	$= -0.007x^6 + 0.075x^5 - 0.232x^4 - 0.077x^3 + 0.873x^2 + 0.503x + 3.083$ ($R^2 = 0.440$)	$= -3.33 + 0.437*ANB + 0.117*SE + 0.115*SN\text{-}GONG + 0.146*SND$ ($R^2 = 0.459$)
For young women		
Max1-NA	$= 0.003x^6 - 0.030x^5 + 0.017x^4 + 0.482x^3 - 0.539x^2 - 3.387x + 26.11$ ($R^2 = 0.524$)	$= 27.71 - 2.036*ANB - 0.963*POG\text{-}NB$ ($R^2 = 0.542$)
1u-Na	$= 0.0003x^6 - 0.005x^5 + 0.021x^4 + 0.034x^3 - 0.239x^2 - 0.590x + 6.321$ ($R^2 = 0.499$)	$= 6.859 - 0.660*ANB - 0.306*POG\text{-}NB$ ($R^2 = 0.503$)
Mand1-NB	$= 0.001x^6 - 0.012x^5 + 0.027x^4 + 0.128x^3 - 0.246x^2 + 1.313x + 21.01$ ($R^2 = 0.486$)	$= 76.61 + 2.424*ANB - 2.064*POG\text{-}NB - 0.816*SNA + 0.282*SL$ ($R^2 = 0.622$)
1l-NB	$= 0.001x^6 - 0.007x^5 + 0.014x^4 + 0.089x^3 - 0.259x^2 + 0.228x + 3.733$ ($R^2 = 0.321$)	$= 2.731 + 0.362*ANB - 0.423*POG\text{-}NB + 0.085*SE$ ($R^2 = 0.445$)

Notes: x – value of angle ANB; ANB – angle ANB (°); POG-NB – angle POG-NB (°); SE – distance SE (mm); SL – distance SL (mm); SNA – angle SNA (°); SND – angle SND (°); SN-GOGN – angle SN-GOGN (°); SN-OCP – angle SN-OCP (°).

Summarizing the results, we see that the distribution of angular and linear indexes of the position of the central incisors in Ukrainian young men and women shows a great variability with respect to the ANB angle. The definite polynomial functions with 6 degrees have an approximation value of 0.32-0.59. The developed regression functions have a larger approximation value of 0.46-0.77 and consider all the requirements of modern medical statistics.

Analyzing the developed mathematical models, we can see that when determining the position of the central incisors of the lower and upper jaws in young men, 100 % of the models include the angle ANB and 50% of the models – angle SN_OCP. In young women, 100 % of models include a Pog_NB distance index, and 75 % of them – ANB angle.

Historically, modern medicine, and orthodontics is no exception, often uses simple averages that are easy to put into practice. Most standard diagnostic techniques [1, 11], as a rule, offer an average value and/or limit value. Our study of Ukrainian young men and women with normal occlusion showed

considerable variability and differences for the incisors' position, as other studies indicate. For example, M. B Gonzalez et al. [4] reasonably recommend the use of diagnostic values adapted to the Mexican population based on a Mexican ethnic group study that proves the existence of significant differences, in particular, the anterior location of the incisors of the upper and lower jaws, and reduction of the interincisor angle compared to the generally accepted European standards by the diagnostic methods of Ricketts, Steiner, Tweed and Arnett.

Significant differences of cephalometric indices of the position of the frontal group of teeth with S. Stainer indices are revealed, which show greater anterior teeth were more proclined and protruded, which caused the formation by E Hussien with co-authors [5] a normative base of measurements based on gender for Palestinian residents. Research by J.N. Sharma and others [13] except differences with the Europeans and the Japanese prove even the existence of significant differences by S. Stainer indices in residents of Nepal belonging to the Indo-Aryan and Mongoloid groups. The importance of considering age, apart from ethnic characteristics, is indicated by the research of A.S. Rathore et al. [12], which created a base of recommended values for mewari children.

Unlike most other diagnostic methods proposed [1, 11], in addition to the mean standard values, Stainer`s method also provided individualized standard values depending on the nature of the ratio of the upper and lower jaw, which is characterized by the value of the angle ANB. Therefore, for each ANB angle value, S. Stainer proposed a set of values characterizing the positions of the upper and lower central incisors [1].

However, with increasing quality of treatment and increasing aesthetic requirements, more and more studies indicate the imperfection of existing standards [9] and the existence of variations in values across countries and ethnic groups. Therefore, we investigated the proposed S. Stainer dependence in Ukrainian young men and women with normal occlusion.

Thus, the recommendation of S. Stainer that the importance of considering the index of the location of the chin in relation to the line N-B (distance Pog_NB), in addition to the indicator of the angle ANB found valid and proven confirmation in the Ukrainian population of young women. In young men, the influence of the position of the occlusal plane relative to the base of the skull (S-N) – an indicator of the angle SN_OCP should be noted. Also interesting was the fact that for the index of the location of the crown of the lower central incisor to line N-B, the functions had a very low accuracy of description ($R^2<0.5$), and this indicates the natural variability of this index, regardless of he values of indicators considered within method C. Stainer.

Conclusions

1. The distribution of values of the angular and linear indexes of the position of the central incisors in Ukrainian young men and women show great variability with respect to the ANB angle, which makes the recommendation to use cautiously the normative data recommended by S. Stainer.

2. Regression models built with all the requirements of modern medical statistics provide greater opportunities for understanding the complex morphometric relationships of the structures of the craniofacial complex.

3. Developed prognostic models for determining the linear and angular indexes of the position of the central incisors of the upper and lower jaw should be used to conduct more accurate diagnostics and treatment planning for the consideration of individual human characteristics for Ukrainian young men and women in the diagnostic cephalometric method by S. Stainer.

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Реферати

ОСОБЛИВОСТІ ВИКОРИСТАННЯ ІНДИВІДУАЛІЗОВАНИХ СТАНДАРТНИХ ЗНАЧЕНЬ ПОЛОЖЕНЬ РІЗЦІВ ЗА C. STAINER В УКРАЇНСЬКИХ ЮНАКІВ І ДІВЧАТ
Дмітрієв М.А., Трофіменко Ю.Ю., Черкасова О.В., Керничний В.В., Гунас І.В.

В роботі досліджено коректність використання рекомендованих показників положення центральних різців згідно даних, що отримані C. Stainer для українських юнаків і дівчат які мали фізіологічний прикус, максимально наближений до ортогнатичного. Цефалометричний аналіз проводився за допомогою програми OnyxCeph 3D pro, статистичний аналіз, побудова поліноміальної і регресійних моделей проводилося в MS Excell і "Statistica 6.0". Аналіз розподілу кутових та лінійних показників положення центральних різців у українських юнаків та дівчат виявив значну варіабельність по відношенню до кута ANB. Тому для проведення більш точної діагностики та планування лікування із врахування індивідуальних особливостей людини для українських юнаків та дівчат в діагностичній цефалометричній методиці C. Stainer рекомендовано використовувати розроблені прогностичні моделі визначення лінійних та кутових показників положення центральних різців верхньої та нижньої щелепи.

Ключові слова: центрльні різці, цефалометричний аналіз C. Stainer, українські юнаки та дівчата.

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ОСОБЕННОСТИ ИСПОЛЬЗОВАНИЯ ИНДИВИДУАЛИЗИРОВАННЫХ СТАНДАРТНЫХ ЗНАЧЕНИЙ ПОЛОЖЕНИЙ РЕЗЦОВ ПО C. STAINER У УКРАИНСКИХ ЮНОШЕЙ И ДЕВУШЕК
Дмитриев Н.А., Трофиненко Ю.Ю, Черкасова Е.В., Керничный В.В., Гунас И.В.

В работе исследовано корректность использования рекомендованных показателей положения центральных резцов согласно данных, полученных C. Stainer для украинских юношей и девушек которые имели физиологический прикус, максимально приближенный к ортогнатическому. Цефалометрический анализ проводился с помощью программы OnyxCeph 3D pro, статистический анализ, построение полиноминальной и регрессионных моделей проводилось в MS Excell и "Statistica 6.0". Анализ распределения угловых и линейных показателей положения центральных резцов в украинских юношей и девушек обнаружил значительную вариабельность по отношению к углу ANB. Поэтому для проведения более точной диагностики и планирования лечения с учетом индивидуальных особенностей человека для украинских юношей и девушек в диагностической цефалометрической методике C. Stainer рекомендуется использовать разработанные прогностические модели определения линейных и угловых показателей положения центральных резцов верхней и нижней челюсти.

Ключевые слова: центральные резцы, цефалометрический анализ C. Stainer, украинские юноши и девушки.

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NEWEST APPROACHES TO THE DIAGNOSIS OF HYPERPLASTIC PROCESSES IN GYNECOLOGY

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The efficacy of elastography as an additional diagnostic method in the ultrasound examination of the pelvic organs in patients with hyperplastic processes of the uterus and endometrium was studied. 75 women of reproductive age from 24 to 40 years with hyperplastic processes of the uterus and endometrium were examined. Of these, 20 women had diffuse-nodal, diffuse or nodal forms of uterine fibroids, 15 – endometrial hyperplasia, 17 – uterine polyps, 23 –adenomyosis. General clinical studies, ultrasound of the pelvic organs with elastography using General Electric Voluson E8 ultrasound apparatus were performed. At suspicion of an atypical etiology of processes, the histopathological study was carried out. It was shown that ultrasound elastography was an additional method of examination and allowed to differentiate hyperplastic processes of the endometrium from oncologic processes and to estimate the depth of invasion process, clarified the diagnosis of the myometrium condition in adenomyosis with clear verification of invasion sites. Verified the morphological etiology of uterine polyps. Diagnosed the condition of nodal diffuse proliferation in uterine leiomyoma to monitor conservative management and treatment.

Key words: elastography, proliferative processes, adenomyosis, leiomyoma, polyp.

Hyperplastic processes account for a significant percentage of the pelvic organ pathology, the prevalence and frequency of which depends on many factors: neuroendocrine, immune, genetic, age-related, and adaptive [1, 2, 3, 4, 7, 8, 10, 11, 12]. In particular, it depends on: apoptosis processes, molecular genetic disorders, endodermal tissue growth factor, angiopoietin, cytokines [9, 12]. They are one of the causes of loss of reproductive function and reduced efficiency of women aged 34– 45 years [1, 2]. The urgency of the problem of hyperplastic process diagnosis is undeniable, as it is due to the high risk of malignancy. Diagnosis of these processes always has a comprehensive approach, taking into account