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RESULTS OF THE STUDY OF THE CORRELATION BETWEEN OCCLUSAL AND POSTURAL BALANCES IN YOUNG PEOPLE

Abstarct. The aim of the present research was to study the correlation between occlusal and postural balances in young people using the methods of computer occlusion diagnostics and computer stabilometry.

Materials and methods. The postural balance was studied using computer stabilometry in individuals aged 25 to 44, selected in two groups (main and comparison), equal in number, age, and gender (30 persons in each group, equally male and female). According the data of clinical trial and computer occlusion diagnostics, the individuals in the comparison group were diagnosed with near-ideal occlusal contacts, and among the patients of the main group, the occlusion imbalance was revealed. In the patients of the main group, computer stabilometry was performed twice – before and after occlusal correction using occlusal splints.

Results. It was found that the persons of the main group had worse indices of body stability in space ($p < 0.05$). Between indices of occlusal balance and results of the stabilometric study, it was established a direct, average in strength, correlation ($r = 0.41$, $p < 0.05$). The correlation index was more significant in the main group ($r = 0.48$, $p < 0.05$), than in the comparison group ($r = 0.34$, $p < 0.05$). The use of occlusal splints improved the postural balance in patients in the main group ($p > 0.05$). So, there was a trend towards a decrease in the values of all indices of computer stabilometry. However, a one-time occlusal correction did not allow the results to be approximated by values in the comparison group ($p > 0.05$).

Conclusions. The obtained data make it possible to recommend the study of postural reflex, in particular the use of computer stabilometry, for planning and evaluation of the effectiveness of the rehabilitation of patients after prosthetic treatment of defects and deformities of dentitions.

Keywords: occlusion, posture, occlusal diagnostics, computer stabilometry.

Background. The key to effective prosthetic dental treatment is the restoration of functional occlusion [1]. Unfortunately, the introduction of modern technologies for the production of dentures does not guarantee building occlusion, consistent with the activities of both masticatory and musculoskeletal systems. First of all, it requires dentist's knowledge and skills in gnatology, which is closely related to posturology [2]. Now, it is argued, that postural disorders may impede the complete adaptation of patients to prosthetic treatment of dentitions and, on the contrary, occlusive imbalance can cause postural disorders [3].

From the point of view of modern gnatology, the pathogenetic interrelation of the functional state of the

dental and postural systems is as follows. The body reaches the correct position of the head in a horizontal plane with the postural reflexes. Accordingly, in the case of occlusal imbalance, in the case of asymmetric distribution of the chewing load in the cranio-cervical-mandibular department, all structures of the musculoskeletal system adapt to its compensation [4, 5].

Despite the relevance of this problem for prosthetic dentistry, the association of posture and occlusion remains not fully studied [6, 7], which makes such theoretical assumptions impossible to put into practice.

At the same time, the modern computer technologies, such as T-Scan computerised occlusal diagnostics and computer stabilometry, used in the present study, allow to characterize the features of occlusal contacts and postural reflexes objectively. So the further analysis of the relationship between them becomes more exact [8, 9]. In addition to scientific novelty, the obtained results will provide a practical solution, which will be to substantiate the tactics of medical tactics for dental prosthetics of patients from the standpoint of a complex neuromuscular approach for occlusion normalisation.

Thus, **the aim** of the present research was to study the correlation between occlusal and postural balances in young people using the methods of computer occlusion diagnostics and computer stabilometry.

Materials and methods of research. In order to ensure the representativeness of the results of the presented study, the formation of research groups (main and comparison) was conducted among persons aged 25 to 44 years, who belong to the young age according to the WHO classification. Exclusion criteria for the study were the presence of postural disorders, periodontal tissue and oral mucosa disorders, diagnosed dental-jaw abnormalities. All subjects included in the study had an orthognathic bite. Also, in our study there was no southpaw.

The examination included an external inspection, during which the proportionality of the face was evaluated, and the inter-alveolar height was adjusted to the height of the relative physiological rest. In addition, palpation of the chewing and temporal muscles and temporomandibular joints was performed to determine the synchronization of movements and the presence of pain. According to the indications, additionally, the condition of the temporomandibular joints was investigated with the help of computer tomography "Orthphos DS" ("Sirona", Germany).

Examination of the oral cavity included the estimation of the central occlusion. The signs of functional overload of teeth were verificated by the form of facets of increased teeth wear, cracks and chips of enamel or veneers of dentures, abfractions of teeth. The character of occlusal contacts in centric (or normal) and eccentric occlusions were determined using the method of occlusiography with articulation paper "Bausch" with different thickness.

The analysis of occlusal contacts was also performed on diagnostic models in the non-Arcon articulator "Stratos® 300" ("Ivoclar, Vivadent", Austria). For individual adjustment of the articulator, bite registers of silicone materials were obtained from each patient in a state of centric (habitual) and eccentric (anterior and lateral) occlusions. Jaw models were fixed in the articulator using a face bow UTS 3D ("Ivoclar, Vivadent", Austria). Subsequently, eccentric occlusions were analysed to investigate the presence of premature contacts on the working and balancing sides.

Additionally, the area, intensity, and sequence of interdental contacts in centric and eccentric occlusions were examined by computerized analysis using "T-Scan III" apparatus ("Tekscan", USA).

The results of computerized occlusion diagnostics were compared with the data of the clinic occlusiography and the examination of diagnostic models in the articulator.

On the basis of the complex clinical examination we have formed two research groups: comparison and main, equal in number, age, gender (30 persons in each group, equally men and women). The average age of the subjects was 35.3 ± 1.0 years. The evaluation of the external survey data of the persons, selected for the study, did not reveal any visual pathological changes. Chewing muscle and temporomandibular joint disorders were also not detected.

The comparison group included 30 persons with occlusion, close to perfect, both from clinical observation and computer diagnostics. These individuals had intact dentitions. Only 5 of them (16.7 %) had direct restorations of the crown parts of the teeth, located outside the occlusal surfaces. According to the results of the T-Scan, the signs of physiological occlusion were: the absence of contacts, painted in red and pink; the presence of multiple contacts, preferably blue, evenly distributed throughout the dentition; no significant difference in strength between multiple contacts of blue and contacts of other colours (except red and pink); uniformity of percent load between antagonist teeth right and left relative to the centre line (50 % - 50 %); relative straightness of the vector of total load, which must begin in the frontal area and end in the centre of the middle third of the palate.

In the main group there were 30 patients, who had defects in the crowns of teeth and dentitions, and significant occlusive imbalance, which according to computer diagnostics exceeded 60 % - 40 %.

In both research groups, postural reflexes were diagnosed with computer stabilometry using the medical simulator "SportKAT 4000", the main element of which was a movable platform, mounted on a soft rubber chamber, filled with a central axis and containing pressure sensors. The mobility of the platform is regulated: the higher the air pressure, the more stable it is. The apparatus includes a flat-screen computer and an installed program to process the results.

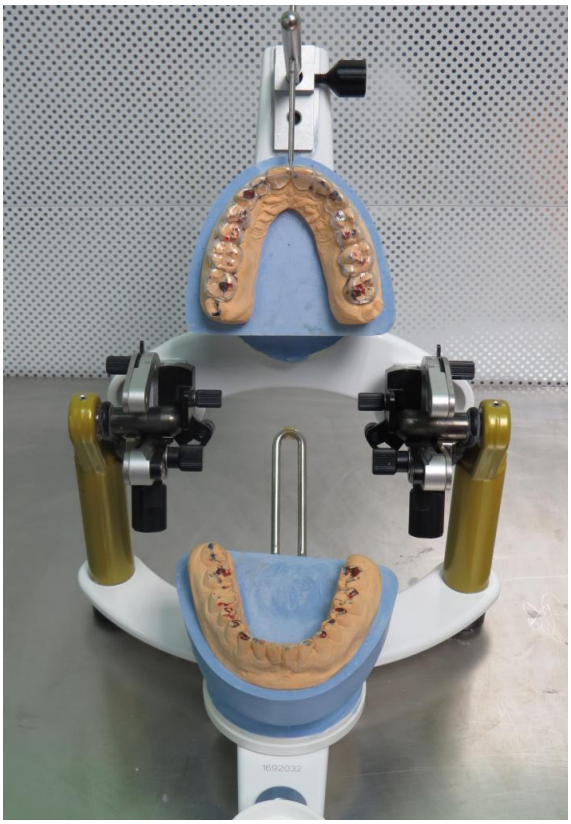
The studies were performed at high air pressure in the chamber corresponding to mark 6, when performing a statistical test to determine the position of the body in the space with the closed dentitions, eyes open and crossed arms on the chest, for 30 seconds (previously

patients were given the opportunity to adapt on the platform for 5 minutes).

To perform the test, the person stood at the centre of the platform and tried to hold the cursor in the centre of the monitor. The computer program calculated the points, based on the time and distances of the cursor during moving from the centre of the screen to the side. Quantitative analysis was subject to the number of deviations of the total centre of mass of the body front, back, right, left, and the difference between the values back and front, right and left (in points). The computer program also calculated the integral index - the balance index (BI) - the sum of all received points.

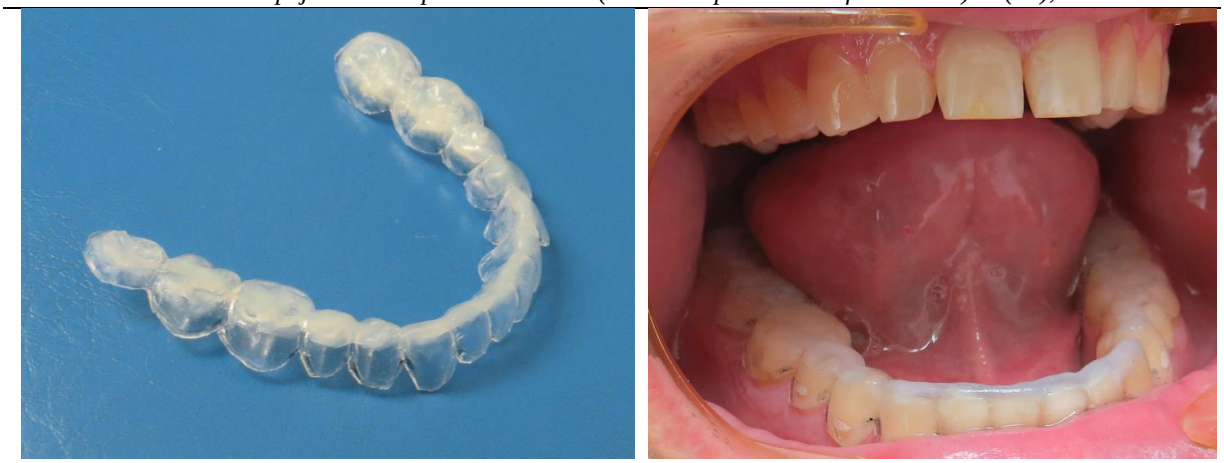
In the patients in the main group, computer stabilometry was performed twice - before and after occlusal correction with the use of occlusal splints.

Occlusal splints were made according to the indications on the maxilla and mandible, using the method of thermoplastic vacuum forming (Fig. 1). Two working models were casted from the maxilla and mandible impressions. It was determined and recorded the optimal central position of mandible, and then models were fixed in the articulator. The first working model was used to plan the design of the occlusal splint. A chemical pencil applied the boundaries of the splint base. The base of the model was shortened on the trimmer to the border of the transition fold. The basis of the occlusal splint was made by thermoplastic vacuum forming from a rigid acrylic plate. In 10 minutes after forming, the base was cut along the boundary, rounded off its edges and fit on the second working model, which was fixed in the articulator (Fig. 1a). In the articulator the necessary configuration of the occlusal surface was reproduced with wax (Fig. 1b). Replacement of wax on plastic was carried out by casting in a cuvette, smelting the wax, compression and polymerizing colourless plastic. After removing the wax, the outer surface of the splint, contacted with the plastic, was processed with a milling cutter and degreased with the AKR-7 monomer. The base and the modelled occlusal surface were provided by compression. The splint was subjected to stepwise grinding in the articulator and in the oral cavity, during which inclined platforms were created for position the mandible (Fig. 1 c, d). The correctness of the restoration of occlusion on the splints was also checked by T-Scan diagnostics.



a

b



c *d*

Fig. 1. Clinical and technological stages of making the occlusal splint on the mandible (explanation in the text).

The obtained data at different stages of research were processed with traditional variation statistics method, using the licensed software MS Excel 2003 [10]. The correlation was calculated between the occlusion imbalance index (deviation from the occlusal balance according to computer occlusion diagnostics) the balance index (according to computer stabilometry).

Results and discussion. As a result of occlusiography, the interdental contacts in the central occlusion were symmetrical and located on the occlusal surfaces of almost all groups of teeth (on the tops and slopes of the cusps, also in the fissures of molars and premolars, at the cutting edges of the lower frontal teeth and palatine surfaces of the upper frontal teeth).

The results of the study of the diagnostic models of the patients from the comparison group in the articulator were registration of incisor overlap in the frontal part of the dentitions and sulcus-cusps contact – in the lateral parts, which were determined by normal slight wear of the surfaces of the teeth in the form of facets.

In the analysis of eccentric occlusions, 67.0 % of patients had canine guidance, and the remaining 33.0% had group guiding function. Centric supracontacts were observed in 8.0% of cases, protrusion – in 6.0%, and laterotrusion – in 1.0%, mediatrusion – in 4.0%.

According to the results of T-scan computer analysis, the balance of occlusion (uniformity of distribution of interdental contacts on the right and left sides of the jaws) was approaching 50% - 50%. The average value of the deviation from the balance for the persons in the comparison group was 8.0 ± 2.1% ($p < 0.05$). A symmetrical distribution of occlusal forces was observed on both sides of the dentitions, which resulted in the predominant localization of the total vector of the trajectory of the occlusal loading from the first occlusal contact to the last contact in the molar zone, which is the point of physiological support during the closure of the dentitions. Supracontacts in the dynamic occlusion were single; the movements of the mandible were free, without interference.

In these individuals it was noted the uniform occurrence of occlusal contacts throughout the dentitions, both in the initial phases of jaw closure and in the final phase, characterizing the state of maximum interdental contacts in functional occlusion.

In contrast to the comparison group, a significant number of contacts in the patients of the main group were found when evaluating occlusion in clinics. Centric occlusion disorders were manifested by unstable occlusion of the dentitions, minimal desocclusion of the lateral teeth, and overload of the anterior teeth during occlusion. Disorders of dynamic occlusion were also characterized by long centric sliding, difficulty in displacement of the mandible forward and to the side, blocking movements in protrusion. The use of articulation paper revealed 53.3 % of balancing and hyper-balancing contacts from the non-working side (mediatrusive contact). Accordingly, balancing and hyperbalancing contacts on the work side (laterotrusive contact) were established in 63.3 %. Finally, protrusion supracontacts were observed in 83.3 % of cases.

Among the patients of the main group, the analysis of diagnostic models in the articulator allowed to register an increase in the area of contact between the teeth-antagonists and the signs of desocclusion. In 66.7 % of the patients, not only the supporting but also holding cusps of molars were contacted. Canine guidance was established in 53.3 % of patients, group guiding function – in 30.0 %, and balancing occlusion – in 16.7 %. Supracontacts on the work side were found in 70.0% of cases, balancing contacts – in 60.0 %, hyperbalancing contacts – in 46.7 %.

According to the results of T-Scan-diagnostics, the average values of occlusal imbalance (deviation from 50 % - 50 %) in the main group were 16.4 ± 1.8 % ($p < 0.05$). The highest reported occlusion disorder was set at 30.0 % - 70.0 %. Accordingly, a significant occlusal imbalance was characterized by a significant shift in the total vector of the trajectory of the occlusal load. The most common violations were centric contacts, which formed as consecutive single, multiple, one-, and two-way overloads; they were constantly changing as they slipped into dynamic occlusion. Supracontacts were observed at the time of maximal occlusion compression. Premature contacts prevented

symmetrical contacts on both sides of the jaws. Most often occlusal contacts, which exceeded physiological strength significantly, were observed in the area of molars on both sides of the jaws.

The results of computer stabilometry are given in Table. It was found that patients from the main group, that is, those who were diagnosed with occlusive imbalance in excess of 40 % -60 % by computer analysis, had worse body stability in space ($p < 0.05$).

Table

Comparative analysis of computer stabilometry results in research groups (M ± m)

Computer stabilometry indices		Groups			P_{1-2}	P_{2-3}	P_{1-3}
		comparison (n=30)	main				
			before occlusal correction (n=30)	after occlusal correction (n=30)			
Deviation of the total centre of mass, points	right	43.6±2.8	56.5±3.8	50.8±3.5	<0.05	>0.05	>0.05
	left	47.0±2.9	65.0±5.3	57.0±5.2	<0.05	>0.05	>0.05
	front	45.0±2.5	58.0±4.0	52.4±3.8	<0.05	>0.05	>0,05
	back	48.0±3.0	62.2±4.2	55.2±4.0	<0.05	>0.05	>0.05
Ratio	right-left	0.038±0.005	0.10±0.01	0.08±0.01	<0.001	>0.05	<0.05
	front-back	0.037±0.004	0.12±0.01	0.10±0.01	<0.001	>0.05	<0.05
Balance index, points		184.2±16.0	242.0±21.0	215.4±20.0	<0.05	>0.05	>0.05

Thus, if in the comparison group the average values of the deviation of the body from the centre of mass to the right and left were 43.6 ± 2.3 points and 47.0±2.8 points, then in the main group - 56.5 ± 3.8 points and 65, 0 ± 5.3 points ($p < 0.05$). Accordingly, front and back indices for the study groups also differed – 45.0 ± 2.3 points and 48.0 ± 3.0 points for the comparison group versus 58.0 ± 4.0 points and 62.2 ± 4.2 points for the main group ($p < 0.05$). As can be seen from Fig. 2, in the research groups the prevalence of some direction of deviation of the total centre of mass (by average) was not observed. In any case, a greater number of deviations were evident in the subjects from the main group ($p < 0.05$).

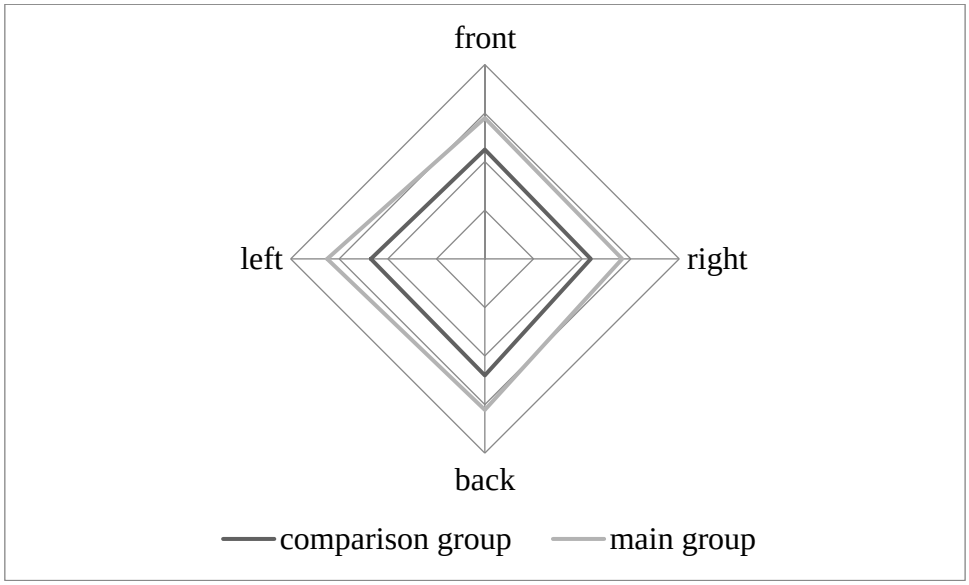


Fig. 2. Directions of deviation of the total centre of mass of the body in the comparison and main (before the occlusion correction) groups, points.

The ratio between right-left and back-front indices were 0.038 ± 0.005 and 0.037 ± 0.004 in the comparison group and 0.10 ± 0.01 and 0.12 ± 0.01 in the main group ($p < 0.001$). Lower percentages in the patients of the comparison group indicated a better balance between movements in contrary with patients from the main group.

Thus, a significant difference was established between the indices of postural balance of experimental subjects who had occlusal imbalance and those whose occlusion was found to be balanced.

According to the values of BI indices, excellent test results (up to 250 points) were registered in all persons in the comparison group and in 18 patients

(60.0 %) in the main group, which can be explained by their young age and the absence of concomitant pathology.

The regression-correlation analysis allowed to calculate a direct, average in strength correlation between the indices of occlusal balance and the results of the stabilometric study ($r = 0.41$, $p < 0.05$). It should also be noted that the correlation index was more pronounced in the main group ($r = 0.48$, $p < 0.05$) than in the comparison group ($r = 0.34$, $p < 0.05$).

In turn, the use of occlusal splints improved the postural balance of patients in the main group ($p > 0.05$). There was a tendency to decrease values of all indicators of computer stabilometry (see Table). However, a one-time occlusal correction did not allow the results to be approximated by values in the comparison group ($p > 0.05$).

Conclusions. 1. The results of the study suggest that there is a correlation between occlusal and postural balance in young people. Thus, in patients, who have occlusial disorders according to clinical examination and computer diagnostics, significantly worse indices of computer stabilometry were recorded.

2. The obtained data make it possible to recommend the use of postural reflex research, in particular the use of computer stabilometry for planning, as well as to evaluate the effectiveness of rehabilitation of patients after prosthetic treatment of defects and deformities of the dentitions.

3. Normalization of occlusal contacts in patients with diagnosed occlusal imbalance using the occlusal splints does not lead to significant changes in statokinetic parameters, although there is a tendency to normalize them, which needs further investigation.

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CLINICAL STATUS OF PATIENTS WITH CHRONIC KIDNEY DISEASE AND RISK OF PROGRESSION OF THE DISEASE DEPENDING ON THE PRESENCE OF METABOLIC DISORDERS.

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КЛИНИЧЕСКИЙ СТАТУС БОЛЬНЫХ С ХРОНИЧЕСКОЙ БОЛЕЗНЬЮ ПОЧЕК И СТЕПЕНЬ РИСКА ПРОГРЕССИРОВАНИЯ БОЛЕЗНИ В ЗАВИСИМОСТИ ОТ НАЛИЧИЯ МЕТАБОЛИЧЕСКИХ НАРУШЕНИЙ.

Summary. An increase in the number of patients with CKD is associated with an increase in major risk factors. The clinical and functional state and comorbid background of patients with chronic kidney disease were evaluated. According to the authors, the detection rate of patients with CKD using the calculated formulas of GFR and nephroprotective measures using RAS blockers turned out to be low in the studied group of patients, while the use of potentially nephrotoxic agents was frequent, which emphasizes the need for sensitization of a wide range of clinicians in relation to the identification of patients with low GFR, with markers of renal damage and with a certain comorbid background and metabolic disorders.