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Correlation between sagittal jaws position and jaws relationship in children with skeletal class III malocclusion

Korelacije sagitalnog položaja vilica i međuviličnih odnosa kod dece sa malokluzijom III skeletne klase

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SUMMARY

Introduction/Objective The evaluation of sagittal jaws relationship is crucial in orthodontic diagnostics, treatment planning and monitoring of its results. A large number of parameters has been established for their assessment.

The aim of this study was to determine the significance of the correlation between the indicators of sagittal jaws relationship, ANB, AOBO, AFBF, NAPg and OJ, one with another, and with indicators of the sagittal position of the jaws, SNA and SNB, in children with skeletal class III malocclusion.

Methods A total of 100 children with mixed dentition, of both genders, based on the profile cephalometric analysis, were divided into two equal groups: group 1 (test group) - children with skeletal class III (n = 50), group 2 (control group) - children with skeletal class I (n = 50).

Results In children with skeletal class III malocclusion, significant correlations were found among the indicators of sagittal jaws relationship ANB, AOBO, AFBF, NAPg, OJ, mutually, except between AOBO and AFBF. A significant correlations of these parameters were also achieved with SNB angle, but not with SNA angle.

Conclusion Confirmed significant correlation between tested indicators in the sagittal jaws relations indicates that, if in routine application of any of the above mentioned parameters in the everyday course of work, we find skeletal jaws relationship Class III, or just a simple reversed incisors overbite in children, it should be indubitably checked and monitored using a larger number of parameters, especially those that define the sagittal position of the mandible.

Keywords: skeletal class III malocclusion, mixed dentition, children, correlation, sagittal jaws relationship.

SAŽETAK

Uvod/Cilj Procena sagitalnih međuviličnih odnosa od ključnog je značaja u ortodontskoj dijagnostici, planiranju ortodontskog lečenja i praćenju njegovih rezultata. Za njihovu procenu ustanovljen je veliki broj parametara.

Cilj ovog rada bio je da utvrdi značajnost korelacija pokazatelja sagitalnih međuviličnih odnosa, ANB, AOBO, AFBF, NAPg i OJ, međusobno i sa pokazateljima sagitalnog položaja vilica, SNA i SNB, kod dece sa malokluzijom III skeletne klase.

Metode Ukupno 100 dece sa mešovitom denticijom, oba pola, selekcionisano je na osnovu kefalometrijskih analiza profilnih telerendgenskih snimaka na dve jednake grupe: grupa 1 (ispitna grupa) – deca sa malokluzijom III skeletne klase (n=50), grupa 2 (kontrolna grupa) – deca sa skeletnom I klasom (n=50).

Rezultati Kod dece sa malokluzijom III skeletne klase utvrđene su značajne korelacije između svih ispitivanih pokazatelja sagitalnih međuviličnih odnosa (ANB, AOBO, AFBF, NAPg, OJ), osim između AOBO i AFBF. Signifikantne korelacije ovih parametara ostvarene su, takođe, i sa uglom SNB, dok sa uglom SNA nisu.

Zaključak Utvrđena značajna korelacija između ispitivanih pokazatelja sagitalnih međuviličnih odnosa ukazuje da ukoliko se u svakodnevnom radu rutinskom primenom bilo kog od pomenutih parametara, kod dece utvrdi skeletni međuviličniodnos III klase, ili samo jednostavan obrnut preklop sekutića, trebaga obavezno proveriti i pratiti primenom većeg broja parametara, posebno onih koji definišu sagitalni položaj mandibule.

Ključne reči: malokluzija III skeletne klase, mešovita denticija, deca, korelacije, sagitalni međuvilični odnosi

INTRODUCTION

Cephalometric assessment of jaws relationship in the sagittal plane is crucial in orthodontic diagnostic, orthodontic treatment planning and monitoring of its results, in particular during the early development of severe malocclusions like skeletal class III malocclusion, which is usually not fully clinically exposed and recognizable at that time. During the search for its most relevant indicator, a large number of more or less accepted parameters were established. Lux et al. state that the first step in the description of sagittal jaws relationship was the determination of cephalometric points A and B (Downs 1948), which enabled the construction of ANB angle [1] by Riedel in 1952.

Pendant to ANB angular parameter is a linear parameter AOBO, or Wits appraisal, which is based on the linear distance between the normal projection of points A and B on the occlusal plane, excluding the use of point N, which is radiologically variable.

The linear parameter AFBF is the indicator of sagittal jaws relationship that excludes the use of both the occlusal plane and radiologically floating value N point. Its value is introduced as a distance between normal projection of points A and B on the FH.

Sagittal intermaxillary discrepancy, typical for skeletal class III malocclusion, has often been followed by the formation of a concave profile. Therefore, the NAPg angle, which shows the degree of severity of the facial convexity in Ricketts analysis, was also examined in this study.

One of the most commonly present skeletal characteristics of skeletal class III malocclusion is reverse incisor overbite, which some authors believe is caused by insufficient dentoalveolar compensation of sagittal skeletal jaws relationship mismatches [2]. In cases where this compensation is sufficiently present, the reverse incisor overbite may be absent.

Apart from these most commonly used parameters, some new indicators of sagittal jaws relationshipwere introduced in contemporary orthodontic practice, such as angles YEN, W, ß, μ and others [3, 4, 5]. However, modern orthodontists usually define them only as a supplement in the interpretation of parameter values ANB and AOBO [3].

The aim of this study was to determine whether the children with skeletal class III show a significant correlation among various indicators of sagittal jaw relations, which would indicate whether the use of only one of them may be relevant in the assessment of its development. Furthermore, we examined the correlation of these parameters with the indicators of the sagittal position of the jaw bones, in order to determine whether or not the position of each of them has equal influence on the size of the sagittal skeletal discrepancies at an early stage of development of this malocclusion, which could give clearer focus to early diagnostics.

The working hypothesis of this study reads: In patients with skeletal class III there is significantly bigger correlation of different roentgencephalometric indicators of sagittal jaw relations and sagittal jaws position in comparison with persons with skeletal class I. This fact indicates that the specific skeletal model of the malocclusion was formed in early childhood.

METHODS

The study included a total of 100 children with mixed dentition, 6 -12 years of age, who had a need for orthodontic treatment and who had not previously been treated orthodontically. The study did not include children with congenital anomalies, clefts and hypodontia. Model casts, panoramic radiographs and lateral cephalometric radiographs (the natural position of the head, the position of maximum intercuspation) were made for all children. Duplicate determinations were also carried out for all variables. The measurements were undertaken two weeks apart and no significant differences were found for any of the hard or soft tissue variables in the two data sets. Dividing these children into two equal groups was based on gnatometric and cephalometric analysis. Group 1 (test group) consisted of children with dental and skeletal class III malocclusion (n = 50), ANB ≤ 0 °. Group 2 (control group) consisted of children with dental and skeletal class I (n = 50), normal values of angles SNA 80–82º, 78–80º SNB and ANB = 2–4° (Figure 1). Each group was represented by an equal number of male and female subjects (M = 25, F = 25).

The skeletal sagittal jaws relationshipswere evaluated using the parameters of ANB, AOBO, AFBF, NAPg and OJ (Figure 2), and then, correlations between their values with each other and in relation to indicators of the sagittal position of the maxilla (SNA angle) and mandible (SNB angle) were examined. The values of all parameters were determined in both groups. We used Multiple Comparisons and Brown-Forsythe test to determine the significance of differences in obtained values between groups. To test the correlation relationships among the individual parameters within each group, we used the Pearson correlation test. Statistical interpretation in all analyses was accepted on the probability NS - not significant difference, $p<0.05$ significant difference, $p<0.01$ highly significant difference.

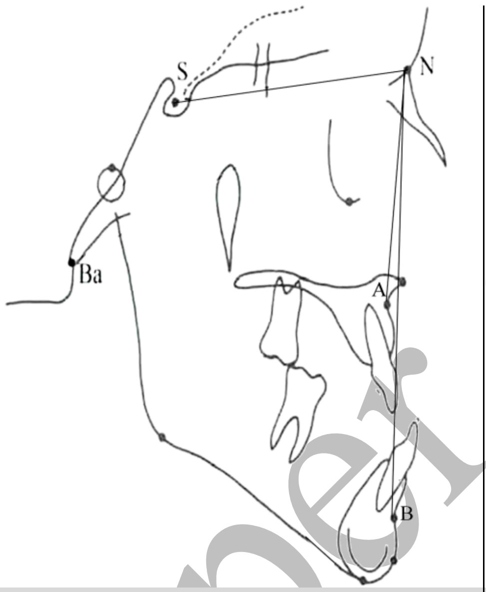


Figure 1. Angular cephalometric measurements for selection into groups used in the study.
SNA - angle of sagittal maxillary position in relation to the cranial base anterior, SNB - angle of sagittal mandibulary position in relation to the cranial base anterior, ANB - angle of sagittal jaws relationship.

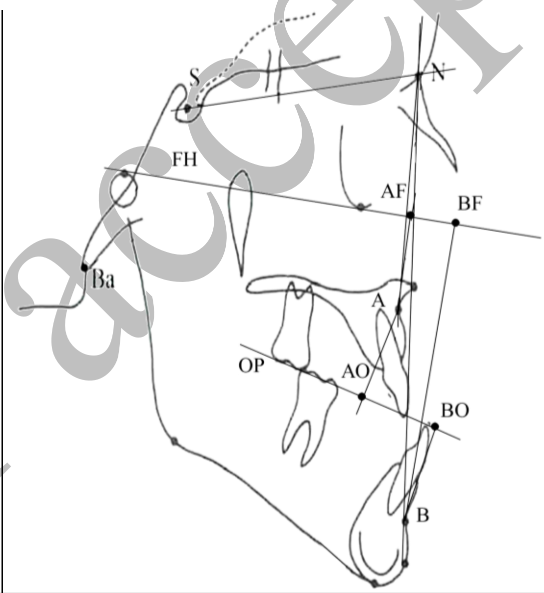


Figure 2. Cephalometric angular and linear measurements for assessment sagittal jaw relationships.
FH - Frankfort plane; AO - normal projection of point A on the occlusal plane of; BO - normal projection point B on the occlusal plane of; AF - normal projection of point A on the FH; BF - normal projection point B on the FH; ANB - angle of sagittal jaws relationship; AOBO, AFBF - linear indicatorsof sagittal jaws relationship; NAPg - facial convexity angle; OJ - overjet.

We have not addressed the analysis of the vertical jaws relationship in this study, as for SNPP, PPMP, SNMP and Bjork polygon parameters values, which have been tested in the previous research conducted in the same population, showed no significant differences between the examined groups [6, 7].

RESULTS

ANB angle in the first group of respondents, the significance of positive correlation was found with the parameters AOBO, AFBF, OJ, NAPg ($p \leq 0,01$), and negative- with SNB ($p \leq 0,01$). There was no significant correlation with the parameter SNA ($p > 0.05$).

In the second group of respondents, ANB had a value which is significantly different from its value in the first group ($p \leq 0.01$). There were significant positive correlations with parameters AOBO, AFBF, OJ ($p \leq 0.05$), NAPg and SNA ($p \leq 0.01$). There was no significant correlation with the parameter SNB ($p > 0.05$).

Table 1. The values of measured parameters (Mann-Whitney, Wilcoxon test).

Parametar	Group	Min	Max	X ± SD	*p*
SNA (°)	1	70	84	77,36 ± 3,58	0,00
	2	80	82	80,78 ± 0,93	
SNB (°)	1	70	90	79,46 ± 3,91	0,12
	2	78	80	78,36 ± 0,66	
ANB (°)	1	-9	0	-2,1± 2,07	0,00
	2	2	4	2 ± 0,73	
AOBO (mm)	1	-16,00	6,00	-6,92 ± 3,63	0,00
	2	-8,50	3,00	-3,05 ± 2,35	
AFBF (mm)	1	-13,00	8,00	-0,80 ± 3,86	0,00
	2	1,00	8,00	4,60 ± 1,93	
NAPg (°)	1	-19	2	-6,14 ± 4,68	0,00
	2	0	13	3,74 ± 2,83	
OJ (mm)	1	-10,00	3,00	-0,60 ± 2,20	0,00
	2	0,00	5,00	1,53 ± 1,19	

In the first group there were significant positive correlations of AOBO with parameters ANB, OJ ($p \leq 0.01$) NAPg ($p \leq 0.05$), and negative with the SNB ($p \leq 0.05$), while with parameters SNA and AFBF there was no significant correlation determined ($p > 0.05$).

In the second group, the AOBO parameter had a value which was significantly different ($p \leq 0,01$) from its value in the first group. Significant positive correlations were found with the parameters OJ ($p \leq 0,01$) and ANB ($p \leq 0.05$), while with the parameters SNA, SNB, AOBO, AFBF and NAPg there was no determined significance of correlations ($p > 0.05$).

Table 2. The values *p* of correlations between the measured parameters in Group 1 (Pearson's correlation test).

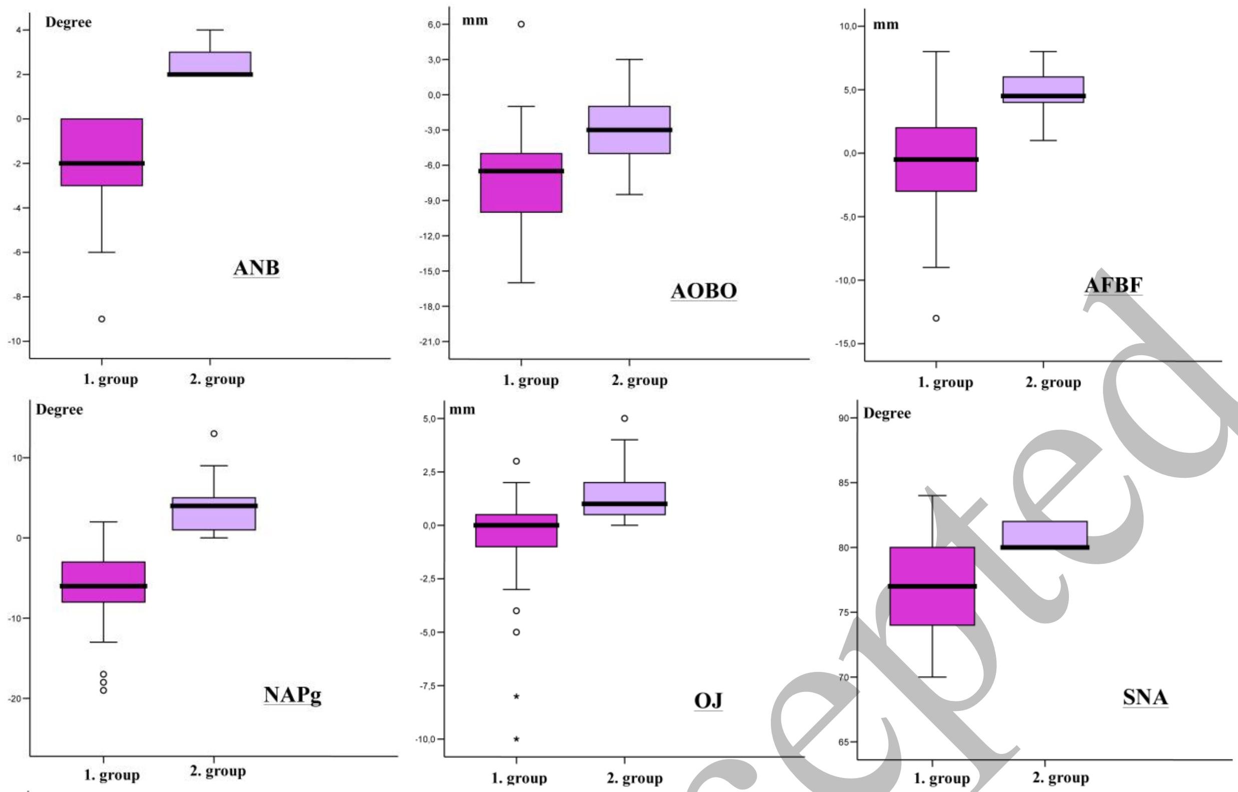
	SNA	SNB	ANB	AOBO	AFBF	OJ	NAPg
SNA	1	.85	n.s.	n.s.	n.s.	n.s.	n.s.
SNB	.85	1	-.42	-.29	-.54	-.46	-.36
ANB	n.s.	-.42	1	.38	.75	.59	.93
AOBO	n.s.	-.29	.38	1	n.s.	.54	.29
AFBF	n.s.	-.54	.75	n.s.	1	.56	.68
OJ	n.s.	-.46	.59	.54	.56	1	.47
NAPg	n.s.	-.36	.93	.29	.68	.47	1

Table 3. The values *p* of correlations between the measured parameters in Group 2 (Pearson's correlation test).

	SNA	SNB	ANB	AOBO	AFBF	OJ	NAPg
SNA	1	.63	.71	n.s.	n.s.	n.s.	n.s.
SNB	.63	1	n.s.	n.s.	n.s.	n.s.	n.s.
ANB	.71	n.s.	1	.30	.33	.30	.48
AOBO	n.s.	n.s.	.30	1	n.s.	.44	n.s.
AFBF	n.s.	n.s.	.33	n.s.	1	n.s.	n.s.
OJ	n.s.	n.s.	.30	.44	n.s.	1	n.s.
NAPg	n.s.	n.s.	.48	n.s.	n.s.	n.s.	1

The parameter AFBF in the first group of respondents had significant positive correlations with parameters ANB, OJ, NAPg ($p \leq 0.01$) and negative with the SNB ($p \leq 0.01$), while with the parameters of SNA and AOBO it did not ($p > 0.05$).

The values of AFBF parameter in the second group of patients were significantly different from the values in the first group ($p \leq 0.01$). A significant positive correlation was found only with the parameter ANB ($p \leq 0.05$).



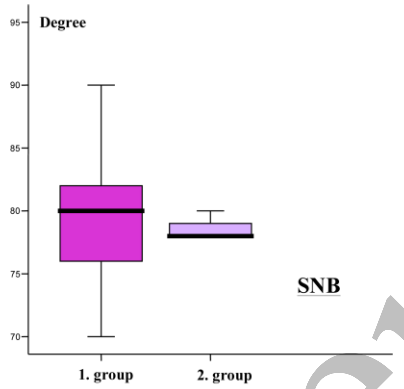


Figure 3. Box plot of the ANB, AOBO, AFBF, NAPg, OJ, SNA, SNB variable in groups 1 and 2.
(median, max value, min value, 25th and 75th percentile, interquartile range, outliers).

In the first group, NAPg angle significant positive correlations were found with the parameters ANB, AFBF, OJ ($p \leq 0.01$) AOBO ($p \leq 0.05$) and negative with the SNB ($p \leq 0.01$), while with the parameter SNA, correlation significance was not established ($p > 0.05$).

In the second group of subjects, the measured values of NAPg angle were significantly different from those identified in the first group ($p \leq 0.01$). A significant positive correlation was found only with the parameter ANB ($p \leq 0.01$).

The horizontal incisal overbite, OJ, in the first group of respondents significant positive correlations were found with the parameters ANB, AOBO, AFBF, NAPg ($p \leq 0.05$), SNA ($p \leq 0.01$), and negative- with parameter SNB ($p \leq 0.01$).

In the second group of subjects, the parameter OJ had a value which is significantly different from its values in the first group ($p \leq 0.01$). As significant, positive correlations with the parameters AOBO ($p \leq 0.01$), ANB ($p \leq 0.05$) were determined, while with the parameters SNA, SNB and NAPg, the significance of correlations was not determined ($p > 0.05$).

The value of SNA angle in group 1 significant positive correlation relationship is established with the parameter SNB ($p \leq 0.01$), while with the indicators of sagittal intermaxillary relations (ANB, AOBO, AFBF, NAPg, OJ), there has not been established correlation significance ($p > 0.05$).

In the second group, the SNA angle had normal values which was significantly different ($p \leq 0.01$) of its values in the 1st group. Significant positive correlations were found with the parameters SNB and ANB ($p \leq 0.01$), while with the parameters of AOBO, AFBF, NAPg, OJ, correlation significance was not established($p > 0.05$).

The SNB angle in the first group of respondents had significant negative correlation with the parameters ANB, AOBO, AFBF, OJ, NAPg ($p \leq 0.01$).

The values of the SNB angle for the second group of respondents were in the normal range and did not differ significantly from the value of this angle in the first group ($p > 0.05$). A significant positive correlation relationship with the parameter SNA ($p \leq 0.01$) was determined, while with the indicators of sagittal intermaxillary relations (ANB, AOBO, AFBF, NAPg, OJ), correlation significance was not established ($p > 0.05$).

The relevance of gender differences was not determined for all values of measured parameters ($p > 0.05$).

DISCUSSION

Starting from the fact that each of the indicators of sagittal jaws relationshiphas its own flaws, in this study they were tested using a large number of parameters - skeletal ANB, AOBO, AFBF, NAPg and dental OJ. Measured average values of all these parameters in children with skeletal class III malocclusion, were significantly different from those in the group of children with skeletal class I, which is in accordance with the results of other authors.

Parameter ANB quickly became the most widely used parameter in orthodontics. According to the same author, in the following years, a great number of publications were published, which was indicated by the influence of geometrical factors on the value of the ANB angle (Taylor, 1969; Freeman, 1981; Pancherz and Sack, 1990; Oktay, 1991), and resulted in numerous suggestions for its correction (Ferrazzini, 1976; Panagiotidis and Witt, 1977; Gebauer, 1979; Hussels and Nanda, 1984; Järvinen, 1986). Jacobson (1975) also recognizes the potential problems that may arise from the use of cranial points far from maxilla and mandible for their mutual assessment of sagittal position. That is why he introduces the use of Wits appraisal which is based on the functional occlusal plane, that is much closer to the dental bases and A and B points. Chang (1987) recommends the use of AFBF distance for the assessment of sagittal jaws relationship, applying the concept of use of FH as a reference plane, which was previously suggested by Luder (1978) [1].

ANB angle, however, remained the most commonly used indicator of sagittal jaws relationship. Normal value of this angle 2º to 4º, in our study was one of the criteria for selecting activities in the control group. Its decreased value is the basic characteristic of skeletal class III malocclusion, and that is why it was the main criterion for selecting activities in the test group.

A study of children of Chinese origin at the time of decideous dentition, as well as studies carried out on the Korean children of the same age, show that the value of the ANB angle was significantly lower in children with III, than in children with skeletal class I [8, 9]. The results of the study of the Syrian children with skeletal classes I and III give very similar information [10]. Reyes, in his study of children of Caucasian origin, divided according to their age in groups from 6 to 16 years, found that the value of this angle in all age groups was significantly lower in children with III, than in children with skeletal class I [11]. Similar results were found also by Chen in a longitudinal study conducted within Japanese girls aged 8 - 14 [12].

Some authors believe that Wits appraisal is a better indicator of sagittal jaws relationship than ANB angle is, for several reasons. Distance AOBO excludes the use of point N, which is radiologically variable. Unlike ANB angle whose value during the prepubertal and pubertal development decreases due to the domination of the sagittal mandibular growth, Wits value remains stable [1, 13].

However, due to the dependence on the vertical distance between points A and B in patients with skeletal class III malocclusion, mandibular growth with a horizontal rotation and a flatter occlusal plane, Wits appraisal is less valid parameter in determining the sagittal jaws relationship, than ANB angle [1, 14]. Roth (1982) and Sherman (1988), describe even an age-dependent positive cumulative effect of increasing the vertical distance between points A and B and the occlusal plane angulation changes due to its horizontal rotation, which results in an increase in the value of Wits appraisal with age, with no real changes in sagittal relationship between points A and B [15, 16]. Lux et al. [1] found that reliability of AOBO parameter in assessing the sagittal jaws relationshipis often limited in children with incomplete overgrown incisors, due to inability of sufficiently precise occlusal plane construction. In adults with normal occlusion, Wits values range from -1 mm to 0 mm, and according to some authors, estimate of Wits 0 ± 2 mm represents the appropriate value in all age groups and for both men and women [1].

Searching for the parameters, whose value in prepuberty age could indicate the need for orthognathic surgery after growth, Schuster defines the Wits appraisal as one of the most valued foreseeing parameter and constitutes subclasification into the surgical and non-surgical group of patients [2]. From all the indicators of sagittal jaws relationship, Zenter considers the values of AOBO the most valid in assessing the performance of the correction of malocclusion of skeletal class III [17]. The results of AOBO parameter examination in children at the time of deciduous dentition, show that there is a statistically significant difference in its value in children with I and the children with skeletal class III, in which negative values were present [8, 9, 12, 14]. A similar finding exists in children aged 5 to 12 years, where, in the group with skeletal class III, the value of Wits estimates were significantly lower than those in the group with skeletal class I [10].

According to the Chen's findings, the values AOBO and ANB parameters are fairly stable in the period of 8 - 14 years [12]. The AOBO distance does not depend on the cranial base length, neither on jaw rotation to the cranial base, which significantly affects the value of ANB angle [18]. In this manner, the AOBO distance indicates the sagittal relationship between the upper and lower jaw, where that relationship does not depend on the relationship to the cranial base, but it is very dependent on the vertical intermaxillary relation. For these reasons, the results of sagittal jaws relationshiptested by linear parameters may be different from the results tested through angular parameters [11, 14].

Optimal distance between normal projection of points A and B on the FH for men is 3.87 ± 2.93 mm, while in women it is 3.87 ± 2.63 mm [3]. This distance, in respondents with good occlusion, followed by the age of 7 to 15 years, is rather stable, with only a slight reduction in the length [1]. According to Chang's research, taking into account all deficiencies of ANB angle, AFBF parameter allows a much more precise determination of sagittal relationship between the maxilla and mandible. However, Luder himself, who first proposed the use of this parameter, put the objection to this method of measurement due to the difficulties related to the construction of FH [1].

Significantly lower values of AFBF were found [8] in the study in children with primary dentition and skeletal class III, than in those measured in children of the same age with skeletal class I.

Although the measured average values of all indicators of sagittal jaws relationship in children with skeletal class III malocclusion differed significantly from those in the group of children with skeletal class I, they were not always in mutual consent.

The value of the ANB angle from 2.0º - 4.0º, which was a basic parameter for the selection of the control group with skeletal class I, was not always in accordance with the values of Wits parameter for skeletal class I, which is consistent with the findings of other authors [11, 14]. Also, in the group with skeletal class III malocclusion, assessment of skeletal jaws relationship using these three parameters,was not always matched, but there was a significant positive correlation between ANB angle values with the values of the parameters and AOBO AFBF. In contrast, the significant correlation for parameters AOBO and AFBF values, has not been established. This finding could be related to the problem of defining the occlusal plane in children with mixed dentition. In addition to these mentioned, significant correlations of mentioned indicators of sagittal jaws relationship with the value of the parameter OJ were recorded.

In the facial skeletal morphology of skeletal class III malocclusion, as mentioned, there is often a concave profile present, and the values of the convexity are reduced. This finding is also recognizable at the time of deciduous dentition, which is also confirmed by the results of the studies in children with III and skeletal class I, indicating a highly significant statistical difference in the values of this angle between them [8, 9]. The results of this study also indicate the existence of significant differences in facial convexity of children with skeletal class III malocclusion and children with skeletal class I. In children with skeletal class III malocclusion, the significant positive correlations of NAPg angle with other parameters that define the sagittal jaws relationships, ANB, AFBF and AOBO, OJ, were established. In the group of children with skeletal class I, a significant positive correlation only with ANB parameter was found.

In their research, Bošković and Nikolić were examining correlations between selected indicators of sagittal jaws relationship, which included children aged 7 to 12, with all three classes of malocclusion, and found a high correlation between ANB angle, Wits values and NAPg [19].

Children with skeletal class III malocclusion had the average value of OJ lower than the normal value of OJ and a significantly lower value than the control group. By the analysis of test results OJ correlations with the selected parameters, the significant positive correlations with all tested parameters that define the sagittal jaws relationships, ANB, AFBF, AOBO and NAPg were determined. In the control group of children, the significant correlation of this parameter only with the parameters AOBO and ANB has been noted.

In a study in children at the age of deciduous dentition, Chang finds a statistically significant difference in the size of OJ, between children with skeletal class III malocclusion and children with skeletal class I [8]. For children aged 5 to 12, Mouakeh gives similar results [10].

It is known from earlier, and modern researches confirm it, that the skeletal jaws relationship in the sagittal plane do not always correspond to dental relationships [20]. The overbite value is not always a realistic rate of sagittal jaws relationship, particularly in patients with skeletal class III malocclusion [14, 18]. However, with or without overlap of these values, early correction of inverted overbite, in the opinion of many authors, is of great clinical importance for maintaining the early corrected skeletal jaws relationship [21].

Also, S. Zupančič was involved in examining the correlations between OJ with indicators of sagittal jaws relationship , ANB, AOBO and NAPg, in children with I, II and III skeletal class [18]. The results of her research were consistent with the results of this study. There were significant correlations between OJ and the examined parameters and in the highest degree with AOBO, which the author associated with the use of the same reference plane (occlusal) for their evaluation. Using the method of linear regression, the same study found that neither in patients with class I, nor in patients with skeletal class III, OJ can be considered as a reliable factor in the assessment of sagittal skeletal jaws relationship [18]. This finding speaks in favor of the known facts that evaluated skeletal and dental sagittal jaws relationship may not be matched, and often, two cases of malocclusion with reverse incisal overbite can look very similar, but after careful cephalometric analysis, the basic problem with them is very different [18]. However, the results of this study, which showed significant correlation of this dental indicator of jaws relationships with skeletal, indicate that the correction of the reverse overbite, as a consequence of their wrong inclination, is an important segment of orthodontic treatment. This correction can be carried out independently, or in combination with other corrections of irregularities related to the skeletal Class III malocclusion [22]. What is especially important, early correction of negative OJ, in many cases is a stable correction, which ensures the creation of favorable conditions for the development of the maxilla [23].

In children with skeletal class III malocclusion, analysis of the results of measurement parameters of the sagittal position of the maxilla indicated the presence of maxillary retrognathism, with a significant difference compared to the values measured in the control group. The determined values of parameters of the sagittal position of the mandible are larger than the average value in the control group, but without statistical significance. Despite such findings, when examining the correlations, more significant correlations of all indicators of sagittal jaws relationship with SNB, than with the SNA, and significant correlation of sagittal jaws relationship with the position of the mandible, than the position of the maxilla were found. This finding may be associated with greater variability of sagittal position of the mandible in the examined age. This increase in variability of the patient may be expected to be even more pronounced, considering the intense mandibular growth.

CONCLUSION

Based on the results of this study, it can be concluded that in children with skeletal class III malocclusion, in the period of mixed dentition there is a significant correlation among the indicators of sagittal jaws relationship , ANB, AOBO, AFBF, NAPg, OJ, while for AOBO and AFBF, the significance of the correlation has not been established. More significant correlations were established between the SNB parameter and all examined indicators of sagittal jaws relationship than with the SNA angle.

This fact indicates that the specific skeletal model of the malocclusion was formed in early childhood, which is why there are grounds to consider this malocclusion a syndrome. Due to the established relevance of the correlation, the recommendation follows, that if in application of any of the above mentioned parameters in the everyday course of work, we find skeletal jaws relationship Class III in children, regardless of the common absence of characteristic clinical expression, it should be indubitably checked by using a larger number of parameters, because defining each one of them has its flaws and limitations, especially in the period of dynamic development of occlusion. This is evidenced by the lack of the significance of the correlation between the parameters AOBO and AFBF, which although they have common reference points, A and B, still, do not always have congruent values, probably as a consequence of the difficulty in defining the FH (more precisely, the point Po) and the occlusal plane in mixed dentition. Early diagnostics of this serious dental-facial anomaly, which often leads to reserving extensive ortognathic-surgical procedures after the completion of growth, would leave more room for early orthodontic and orthopedic therapy, with the aim of diverting craniofacial growth model within the individual genetic potential.

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