Original Research Article

ASSOCIATION BETWEEN FACIAL, OCCLUSAL AND CEPHALOMETRIC CHARACTERISTICS OF INDIVIDUALS IN PRE-ORTHODONTIC TREATMENT

ABSTRACT

Introduction: The study of the prevalence of malocclusion is important for the knowledge of the common occlusal and facial characteristics of a given population, enabling the prevention, treatment and planning of cases with orthodontic needs.

Objective: The aim of the present study was to evaluate the association between facial, occlusal, and cephalometric findings of individuals in the pre-orthodontic treatment phase.

Materials and methods: This retrospective cross-sectional study was conducted from a sample of 122 orthodontic medical records of patients in the initial phase of orthodontic treatment. Data related to clinical examination, facial analysis, model analysis, radiographic examinations and intra and extraoral photographs were analyzed. Data on facial type, smile classification and aesthetic pleasantness of the face and smile were collected from extraoral photographs. The occlusal findings were analyzed from plaster models. The cephalometric analysis was evaluated from lateral cephalogram of the face. The collected data were tabulated using the SPSS 17.0 for Windows software and the Chi-square, Kruskal, Wallis and Mann-Whitney tests were used to compare the data.

Results: The most prevalent Angle malocclusion was Class II division 1. Statistical association was observed between the variable Angle malocclusion and the following characteristics: facial type, posterior crossbite, anterior crossbite, anterior open bite, overjet, and overbite ($p \leq 0.05$). The Kruskal Wallis and Mann-Whitney tests showed that Class II malocclusion was associated with higher PgNB, NAP, ANB, 1-NB, IMPA, Line S-Ls and overjet values ($p \leq 0.05$).

Conclusion: It can be concluded that the population studied has a high prevalence of Class II division 1 malocclusions and this condition is associated with facial, occlusal, and cephalometric findings.

Keywords: Malocclusion. Orthodontic treatment. Angle Class II.

1. INTRODUCTION

Malocclusion is understood as an alteration of the growth and development of the craniofacial complex that affects the occlusion of the teeth, resulting from an interaction of general factors such as congenital and hereditary alterations, nutritional deficiencies, abnormal pressure habits and local factors such as the presence of supernumerary teeth, dental caries, retention and early loss of deciduous teeth, as well as dental trauma [1-3].

According to the World Health Organization (WHO), malocclusion constitutes the third most prevalent oral health problem, causing harmful effects on functions such as chewing, diction, breathing and swallowing; compromises periodontal health; negatively interferes with the quality of life, social interaction, and psychological well-being of individuals [4-7]. Studies have described the prevalence of malocclusions in the Brazilian population in several regions and found an association with sex, race, socioeconomic status, and region of residence, varying greatly from one region to another [8-10].

In dentistry, as in other health areas, the study of populations is important for the understanding of the determinants and conditioning of health factors, enabling prevention, treatment, and health care planning [11]. In orthodontics, to arrive at a diagnosis and treatment plan, evaluation criteria such as facial analysis, model analysis, cephalometric analysis, and/or smile analysis are necessary [12]. A detailed evaluation and knowledge of malocclusion and its characteristics enable a good treatment plan, as well as knowledge of the prevalence of malocclusion and the characteristics with which it is associated, allowing the development of public policies [13]. In this context, the present study aimed to evaluate the association between facial, occlusal, and cephalometric findings of patients in pre-orthodontic treatment phase.

2. MATERIALS AND METHODS

Study design

This retrospective cross-sectional study was conducted at the Federal University dos Vales do Jequitinhonha e Mucuri (UFVJM) and approved by the Research Ethics Committee under protocol number 3.890.095.

The research was conducted from a sample of 122 orthodontic medical records of patients in the initial phase of treatment at the Division of Orthodontics of UFVJM, in the city of Diamantina, Minas Gerais, Brazil. Data related to occlusal examination, facial analysis, plaster model analysis, radiographic examinations and intra and extraoral photographs were analyzed. All data were collected by two previously calibrated researchers (Kappa = 0.81).

Facial analysis

Data on facial type, smile classification and aesthetic pleasantness of the face and smile were collected from extraoral photographs. The facial types were classified into mesofacial, brachyfacial and dolichofacial [14]. The classification of the smile as high, medium or low was performed based on the following criteria: the high smile is the one with exposure of the entire cervical-incisal length of the dental crown, in addition to a continuous gum band; the medium is the one with exposure of 75 to 100% of the length of the crown; and the low smile is when it exposes less than 75% of the length of the tooth [15]. The aesthetic pleasantness of the face and smile was classified, according to the opinion of the examiners, as aesthetically pleasing (grades 7, 8 or 9), aesthetically acceptable (grades 4, 5 or 6) and aesthetically unpleasant (grades 1, 2 or 3) [16], in a maximum time of 30 seconds.

Data on facial symmetry (symmetrical or asymmetrical), lip sealing (passive or active), and type of breathing (nasal, buccal, or mixed) were also collected from the medical records.

Occlusal analysis

The occlusal findings were analyzed from plaster models. In the analysis of models, the type of denture (deciduous, mixed or permanent), the type of upper and lower arches (atresic, normal or expanded), the transverse relationship of the upper and lower arches (inter canine, inter premolar and intermolar relations), upper and lower dental midlines (coincident or non-coincident), anterior and posterior crossbite (unilateral or bilateral), anterior open bite, overjet, overbite, molar ratio according to the Angle classification (Class I, II and III), and anterior dental crowding (upper and lower) were assessed.

The transverse relations of the upper and lower arches were established with the aid of a millimeter ruler, measuring the inter canine distance from the canine cingulum on one side to the cingulum on the other of the same arch; the inter premolar and intermolar distances were measured from the central grooves of one tooth to the other on the opposite side. The upper and lower dental midlines were said to be coincident when both aligned and not coincident when deviated. Anterior dental crowding, upper and lower, was classified as follows: no crowding and crowding.

Cephalometric analysis

The cephalometric analysis evaluated the skeletal profile and relationship of the apical bases using NAP, SNA, SNB and ANB measurements; the cephalic skeleton pattern with FMA, SNOcl and SNGoMe measurements; the position of the upper and lower incisors in relation to their respective bone bases using the 1.NA, 1-NA, 1.NB, 1-NB and IMPA measurements; the integumentary profile (ANL, H-Nose, S-line); in addition to measurements of maxillary length (CoA), mandibular length (CoGn), AFAI (Anteroinferior Facial Height), Facial Axis, Pg-NB and WITS.

Statistical analysis

The collected data were tabulated in the SPSS software (Statistical Package for the Social Sciences; Chicago; USA) version 17.0 for Windows and the Kolmogorov-Smirnov test was applied to assess the normality of the data. For categorical variables, the Chi-square statistical test was performed and for quantitative variables, Kruskal, Wallis and Mann-Whitney tests were performed. The level of significance was 5% (95% confidence interval).

3. RESULTS

Descriptive analysis

Table 1 presents the descriptive data of the variables studied. Among the 122 documents analyzed, it was found that the age of the patients ranged from 9 to 45 years (mean age 15.3 years; median 14 years), 57.4% were female, 63.10% mixed race and 49.2% of the patients presented nasal breathing.

Facial analysis revealed that 54.1% of the patients were mesofacial, 82% of the faces were symmetrical and passive lip sealing was present in 73% of the analyzed documentation. Regarding facial pleasantness and smile agreeableness, the examiners considered 68.9% of the faces aesthetically pleasing and 56.6% of the smiles acceptable. Regarding the type of smile, it was found that 45.9% were of the medium type (Table 1).

The analysis of models showed that 84.4% of the patients presented permanent denture, 49.2% had Class II of Angle molar ratio, 41.80% were division 1 and 7.4% were division 2. Regarding the shape of the arch, 64.8% and 61.5% of the patients had the upper and lower arches with normal conformation, respectively. The upper and lower midlines were non-coincident in 63.9% of the patients. Regarding the crossbite, 21.3% of the patients had bilateral posterior crossbite and 15.6% anterior crossbite. In the sagittal and vertical evaluation of the dental arches, marked overjet and overbite (≥4) were present in 48.4% and 31.1% of the patients, respectively. Regarding dental crowding, 86.1% and 76.2% of the patients presented upper and lower anterior crowding, respectively.

Table 2 presents the quantitative data of the variables related to the analysis of the plaster models of the patients. The analysis of the plaster models showed mean inter canine distance (33.67 and 26.72), inter premolar distance (36.39 and 31.75) and intermolar distance (46.27 and 42.13), respectively. It was also found that the overjet ranged from -6 to 20 (mean of 3.23) and that the overbite ranged from - 5 to 8 (mean of 2.15).

Table 3 presents the results of the cephalometric analysis. Mean values of SNA of 83.37 (SD= 4.651) and SNB of 80.08 (SD=4.566) were observed. NAP ranged from -17 to 21, while WITTS ranged from -15 to 12. The evaluation of the growth pattern showed an average FMA of 27.50 (SD=5.922), SNOcl of 14.68 (SD=5.415) and SNGoMe equal to 33.67 (SD=6.241). The position of the upper and lower incisors in relation to their respective bone bases was 1.NA (26.73º ± 7.304), 1-NA (6.74mm ± 3.107), 1.NB (29.32º ± 6.974), 1-NB (6.64mm ± 2.965) and IMPA(94.38º ± 8.706).

Associative analysis

A statistically significant association was observed between the variable Angle malocclusion and facial type, posterior crossbite, anterior crossbite, anterior open bite, overjet, and overbite ($p \leq 0.05$). Regarding the facial type, it was found that the mesofacial and brachyfacial were more frequent in Class II, while the dolichofacial was in Class I. For the crossbite, there was a higher prevalence of posterior crossbite in Class II patients and of anterior crossbite in Class III patients it was found that major overjet and overbite were associated with Class II malocclusion (Table 4).

Was observed association between Angle malocclusion and the following measurements: NAP, SNB, PgNB, ANB, AFAI, FMA, 1-NB, IMPA, Line S-Ls, overjet, and overbite. To identify which malocclusion was associated with the variables analyzed, the Mann-Whitney test was applied, which showed that Class II malocclusion was associated with higher values of PgNB, NAP, ANB, 1-NB, IMPA, Line S-Ls and overjet. For the variable FMA, it was found that increase value of this variable was associated with Class I malocclusion (Table 5).

4. DISCUSSION

The study of the prevalence of malocclusions and common facial features allows the identification of patterns in the population and helps in the diagnosis and treatment of malocclusions. Most epidemiological studies differ in the methodology used, especially in the indices used. The different evaluation and association criteria found in the literature make it difficult to standardize the assessment of orthodontic needs in the population and to identify public health problems. In addition, few assess the severity of malocclusions, making it difficult to plan actions in the public health field, such as preventive and intervention policies for cases with greater severity [17-19].

The in-depth study of malocclusions can help in the identification of factors and characteristics common to a given condition and may help in the construction of the treatment plan and the predictability of the result. The present study evaluated the association of Angle malocclusion with facial, occlusal, and cephalometric characteristics of patients undergoing orthodontic pretreatment.

The worldwide prevalence of Angle malocclusions is 74.7% Class I, 19.56% Class II and 5.93% Class III in permanent dentures [1]. Studies in the Brazilian population indicate a prevalence of malocclusion between 25% and 33.8% of individuals aged 12 to 19 years [9, 20], and 32.5% in children aged 3 to 5 years [2]. However, despite the relevant epidemiological findings, the results of the studies are heterogeneous and do not provide an associative analysis of Angle malocclusion with the other orthodontic findings.

In the present study, the prevalence of Angle Class II malocclusion was higher than the national and international averages. This finding may suggest the presence of a profile of malocclusion typical of the local population that needs greater attention from public policies for the preventive and intercepting orthodontic treatment of class II. However, it is noteworthy that regional differences in the prevalence of malocclusions are expected due to different socioeconomic, cultural, educational and access to health services [2, 5, 8, 10, 20, 21].

Angle's malocclusion is a dental classification that considers the anteroposterior relationship of the dental arches, more specifically of the permanent upper and lower molars so that this is only one of the components of malocclusion, which is often associated with other occlusal features such as anterior crossbite, posterior crossbite, anterior open bite, dental crowding, overjet, overbite, and midline deviations. In addition, one should consider the formation of malocclusion facial features such as facial type, facial symmetry, the presence or absence of passive lip sealing, and the type of smile.

The most prevalent malocclusion in the present study was dental crowding. The high prevalence of malocclusions such as upper and lower dental crowding and marked overjet agrees with the studies conducted with schoolchildren, which also showed a high prevalence [5]. In the present study, the evaluation of the presence or absence of crowding without considering the amount of crowding may have led to a more expressive result of this malocclusion when compared to other studies.

Another finding was that accentuated overjet (≥4mm) was more frequent than accentuated overbite (≥4mm), and both were associated with Class II malocclusion, which was expected since Class II malocclusions may present such characteristics. In the present study, the measurements of increased NAP and ANB and decreased SNB may have contributed to a greater overjet in the Class II patient. In addition, the decreased SNB in the Class II patients indicates a sagittal discrepancy between the bone bases, with a more retrusive component of the mandible than a protrusive component of the maxilla. On the other hand, the decreased vertical dimension (decreased AFAI) may indicate a hypodivergent growth pattern and have contributed to a higher overbite. However, the characteristics of overjet and overbite can also be influenced by dentoalveolar growth and the relationship of the incisors with their bone bases [22, 23].

The frequencies of patients presenting with Class III malocclusion, anterior crossbite (or overjet from zero to negative), and anterior open bite (or zero to negative overbite) were similar. However, anterior open bite was equally associated with Class I and Class III malocclusions, while anterior crossbite was associated with Class III malocclusion. These findings may be associated with genetic and/or environmental factors (deleterious oral habits and mouth breathing) [24-26]. The association of the anterior crossbite with Class III was expected, since Class III patients may present an enlarged mandibular growth and/or deficient jaw, a functional deviation of the mandible (caused by premature dental contacts), or dental inclinations that lead to the crossing of the bite in the anterior region [21].

All these associations are expected and likely to occur due to the multifactorial etiology of malocclusions and consequently resulting in great variability in the severity of malocclusions, with the association of a greater or lesser number of components, and in a greater or lesser degree of impairment [20]. Thus, there are several possible combinations to form a malocclusion, and the more complex the malocclusion, the more complicated the diagnosis and treatment. Thus, orthodontists must perform an accurate diagnosis and appropriate and individualized planning for each patient.

The different configurations for the formation of malocclusions may also be influenced by ethnicity, as indicated by the variations in the shapes of the dental arches found in studies of different ethnicities. Thus, in the present study, the intercanine and intermolar, maxillary and mandibular distances were similar to those found by Jhonatan et al. (2014) [27] and were lower than those found by studies conducted in Pakistani [28] and Turkish populations [29]. The atresic upper arch and expanded lower arch forms found in the present study likely led to a higher prevalence of posterior crossbite compared to another study [1].

The different combinations of orthodontic problems arising from a multifactorial etiology can lead malocclusions to present in varied degrees of severity and thus affect to a greater or lesser degree the quality of life of patients, especially in adolescence. Malocclusions make patients susceptible to psychological factors such as decreased self-esteem and self-confidence, difficulty in acceptance and the propensity to bully, affecting quality of life [7]. Silveira et al. (2016) reported that patients with greater severity of malocclusion self-perceived the appearance as negative and considered their social relationships affected by oral health conditions [20]. In the present study, the mean age of the patients was 15.3 years, the age at which individuals undergo physical, psychological and emotional transformations that make them more concerned with their personal and facial appearance. Therefore, a harmonious smile becomes essential for good social interaction and a better quality of life at this stage.

Thus, the early diagnosis of malocclusions and the preventive and interceptive treatment of children and adolescents can improve the quality of life and reduce the embarrassment of malocclusions and dentofacial deformities, reducing or even eliminating the need for future orthodontic treatments. This may be the key to reducing the severity of malocclusions and avoiding the high costs of more complex orthodontic treatments. Therefore, knowledge of the parameters of the most prevalent malocclusions in the populations and the possible associations is important to understand the need for orthodontic treatments in the population and the planning of oral health policies aimed at this public. And, given the high prevalence of malocclusions, considered by the WHO as the third most prevalent oral health problem in the world, not being different in Brazil, it is clear the importance of incorporating orthodontic care into Brazil's public health policies, especially the early treatment during mixed dentures, preventing malocclusion from perpetuating itself in permanent dentures.

It is important to emphasize that the differences in the results in relation to other studies may be influenced by the difference in the age group studied, and the dentofacial complex presents differences in skeletal maturity in children and adults, considering that deviations from normality are less frequent in deciduous dentition than in mixed and permanent dentition. In addition, regional characteristics and the different diagnostic criteria used in the studies interfere with the prevalence and severity of malocclusions.

5. CONCLUSION

It can be concluded that the population studied has a high prevalence of Class II division 1 malocclusions and this condition is associated with facial, occlusal, and cephalometric findings.

ETHICAL STANDARDS

This study was approved by the Research Ethics Committee of the Universidade Federal dos Vales do Jequitinhonha e Mucuri under protocol no. 3.890.095.

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Table 1: Descriptive analysis of the variables studied.

EVALUATED VARIABLES		**N**	**%**
Sex	Female	70	57,4
	Male	52	42,6
Race	Mixed race	77	63,1
	White	18	14,8
	Black	27	22,1
Facial Type	Brachyfacial	17	13,9
	Dolicofacial	39	32,0
	Mesofacial	66	54,1
Facial Symmetry	Symmetrical	100	82
	Asymmetrical	22	18
Breathing	Buccal	17	13,9
	Mixed	45	36,9
	Nasal	60	49,2
Lip Sealing	Active	33	27,0
	Passive	89	73,0
Facial Pleasantness	Aesthetically unpleasant	4	3,3

	Aesthetically acceptable	34	27,9
	Aesthetically pleasing	84	68,9
Smile Pleasantness	Aesthetically unpleasant	12	9,8
	Aesthetically acceptable	69	56,6
	Aesthetically pleasing	41	33,6
Type of Smile	High	38	31,1
	Low	28	23,0
	Medium	56	45,9
Type of Denture	Mixed	19	15,6
	Permanent	103	84,4
Type of Upper Arch	Atresic	28	23,0
	Expanded	15	12,3
	Normal	79	64,8
Type of Lower Arch	Atresic	12	9,8
	Expanded	35	28,7
	Normal	75	61,5
Midline	Coincident	44	36,1
	Non-Coincident	78	63,9
Posterior crossbite	Unilateral	1	0,8
	Bilateral	26	21,3
	Absent	95	77,9
Anterior crossbite	Absent	103	84,4
	Present	19	15,6
Anterior Open Bite	Absent	103	84,4
	Present	19	15,6
Overjet	Zero to Negative	21	17,2
	1 a 3	42	34,4
	≥4	59	48,4
Overbite	Zero to Negative	24	19,7
	1 a 3	60	49,2
	≥4	38	31,1
Angle classification	Class I	41	33,6
	Class II	60	49,2
	Class III	21	17,2
Upper Anterior Crowding	No crowding	20	16,4
	With crowding	102	83,6
Lower Anterior Crowding	No crowding	29	23,8
	With crowding	93	76,2

Table 2: Descriptive analysis of model analysis data (values in millimeters).

EVALUATED VARIABLES	Minimum	Maximum	Average	SD
Superior Intercanine Distance	25	41	33.67	2.961
Superior Interpremolar Distance	32	42	36.39	2.624
Superior Intermolar Distance	38	54	46.27	3.343
Lower Intercanine Distance	21	34	26.72	2.368
Lower Interpremolar Distance	27	40	31.57	2.960
Lower Intermolar Distance	36	48	42.13	2.869
Overjet	-6	20	3.23	3.436
Overbite	-5	8	2.15	2.807

Table 3: Descriptive analysis of the cephalometric variables analyzed.

CEPHALOMETRIC PARAMETERS	Norm	n	Minimal	Maximum	Average	SD
SNA	82nd	122	75	100	83.37	4.651
NAP	0th	122	-17	21	6.04	6.300
SNB	80th	122	70	95	80.08	4.566
PgNB	-	110	-10	21	2.41	3.834
ANB	2nd	122	-8	12	3.32	3.115
WITTS	0 mm	122	-15	12	0.15	4.742
CoA	83 mm	122	67	113	85.68	8.805
CoGn	100 mm	122	81	139	103.65	11.779
AFAI	-	122	54	119	67.95	8.943
SNGoMe	32nd	122	14	49	33.67	6.241
FMA	25th	122	17	43	27.50	5.922
Facial Axis	90th	122	79	112	92.83	6.993
SNOcl	14th	122	1	28	14.68	5.415
1.NA	22nd	122	10	45	26.73	7.304
1-NA	4 mm	122	0	18	6.74	3.107
1.NB	25th	122	11	46	29.32	6.974
1-NB	4 mm	122	0	15	6.64	2.965
IMPA	87th	122	77	131	94.38	8.706
ANL	90-110th	122	82	128	101.18	10.675
H-Nose	9-11 mm	122	-24	21	2.72	6.165
Line S-Ls	0 mm	62	-7	14	1.37	4.009

Line S-Li	0 mm	57	-4	19	2.18	3.735

Table 4: Variables analyzed and their association with malocclusion (bivariate analysis).

VARIABLES	CL I (%)	CL II (%)	CL III (%)	X²	p
Sex					
Female	28.6	50	21.4	2.957	0.228
Male	40.4	48.1	11.5		
Race					
Mixed race	29.9	51.9	18.2		
White	33.3	44.4	22.2	2.478	0.649
Black	44.4	44.4	11.1		
Facial Type					
Brachyfacial	11.8	64.7	23.5		
Dolicofacial	43.6	28.2	28.2	14.500	**0.006**
Mesofacial	33.3	57.6	9.1		
Facial Symmetry					
Symmetrical	33	50	17	0.151	0.927
Asymmetrical	36.4	45.5	18.2		
Breathing					
Buccal	58.8	17.6	23.5		
Mixed	26.7	55.6	17.8	8.521	0.074
Nasal	31.7	53.3	15		
Lip sealing					
Active	33.3	51.5	15.2	0.163	0.922
Passive	33.7	48.3	18		
Facial pleasantness					
Aesthetically unpleasant	50	50	0		
Aesthetically acceptable	47.1	29.4	23.5	8.528	0.074
Aesthetically pleasing	27.4	57.1	15.5		
The pleasantness of the smile					
Aesthetically unpleasant	41.7	50	8.3		
Aesthetically acceptable	34.8	46.4	18.8	1.425	0.840
Aesthetically pleasing	29.3	53.7	17.1		
Smile Type					

Alto	34.2	52.6	13.2		
Low	35.2	46.4	17.9	0.784	0.941
Medium	32.1	48.2	19.6		
Type of Denture					
Mixed	15.8	73.7	10.5	5.458	0.065
Permanent	36.9	44.7	18.4		
Midline					
Coincident	31.8	47.7	20.5	0.515	0.773
Non-Coincident	34.6	50	15.4		
Posterior crossbite					
Absent	37.9	50.5	11.6		
Unilateral	0.0	100	0.0	12.008	**0.017**
Bilateral	19.2	42.3	38.5		
Anterior crossbite					
Absent	38.8	58.3	2.9	95.023	**0.000**
Present	5.3	0	94.7		
Anterior Open Bite					
Absent	32	55.3	12.6	13.687	**0.001**
Present	42.1	15.8	42.1		
Upper Crowding					
No crowding	35	45	20	0.207	0.902
With crowding	33.3	50	16.7		
Lower Crowding					
No crowding	34.5	44.8	20.7	0.422	0.802
With crowding	33.3	50.5	16.1		
Overjet					
Zero to negative	9.5	4.8	85.7		
1 a 3	42.9	52.4	4.8	84.756	**0.000**
≥4	35.6	62.7	1.7		
Overbite					
Zero to negative	41.7	12.5	45.8		
1 a 3	35.0	50.0	15.0	27.655	**0.000**
≥4	26.3	71.1	2.6		

Note: X^2 test; significance at the level of 5% ($p<0.05$).

Table 5: Analysis of statistical differences between malocclusion status and quantitative variables.

Variables	Angle	Mean Rank	p	Variables	Angle	Mean Rank	p

	Malocclusion				Malocclusion		
SNA	Class I	67,67	0,380	**SNOcl**	Class I	63,78	0,857
	Class II	58,85			Class II	60,88	
	Class III	57,02			Class III	58,83	
ANP	Class I	61,88	**0,001**	**1.NA**	Class I	64,95	0,588
	Class II	70,26			Class II	61,35	
	Class III	35,74			Class III	55,19	
SNB	Class I	65,60	**0,012**	**1-NA**	Class I	63,60	0,462
	Class II	52,87			Class II	63,10	
	Class III	78,17			Class III	52,83	
PgNP	Class I	49,53	**0,029**	**1.NB**	Class I	68,52	0,059
	Class II	63,43			Class II	62,11	
	Class III	44,33			Class III	46,05	
ANB	Class I	63,01	**0,001**	**1-NB**	Class I	70,82	**0,017**
	Class II	69,04			Class II	61,32	
	Class III	37,00			Class III	43,83	
WITTS	Class I	63,37	0,073	**IMPA**	Class I	64,06	**0,009**
	Class II	65,74			Class II	67,19	
	Class III	45,74			Class III	40,24	
CoA	Class I	62,66	0,279	**ANL**	Class I	66,84	0,328
	Class II	57,26			Class II	56,70	
	Class III	71,36			Class III	64,79	
CoGn	Class I	59,27	0,637	**H-Nose**	Class I	59,38	0,649
	Class II	60,75			Class II	60,72	
	Class III	68,00			Class III	67,88	
AFAI	Class I	71,28	**0,011**	**Line S-Ls**	Class I	34,67	**0,020**
	Class II	51,79			Class II	34,30	
	Class III	70,14			Class III	17,73	
SNGoMe	Class I	65,68	0,623	**Line S-Li**	Class I	33,26	0,246
	Class II	58,73			Class II	27,83	
	Class III	61,24			Class III	23,10	
FMA	Class I	73,46	**0,028**	**Overjet**	Class I	65,24	**0,000**
	Class II	56,08			Class II	74,59	
	Class III	53,62			Class III	16,79	
Facial Axis	Class I	54,85	0,252	**Overbite**	Class I	52,56	**0,000**
	Class II	66,59			Class II	78,20	
	Class III	59,93			Class III	31,24	

Note: Kruskal Wallis test; Significance at the level of 5% ($p<0.05$).