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Ocena stosunków wielkości zębów w obu szczękach i rozbieżności w zależności od modelu wzrostu twarzoczaszki

Evaluation of intermaxillary tooth size ratios and discrepancies according to craniofacial growth pattern

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Wkład autorów: A Plan badań B Zbieranie danych C Analiza statystyczna D Interpretacja danych E Redagowanie pracy F Wyszukiwanie piśmiennictwa

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Streszczenie

Zachowanie proporcji między zębami szczęki i żuchwy jest kluczowym czynnikiem uzyskania idealnego zaguzkowania po leczeniu ortodontycznym. **Cel.** Celem niniejszej pracy było porównanie stosunków wielkości zębów przednich oraz częstości występowania rozbieżności w zależności od różnych modeli wzrostu twarzoczaszki w populacji pacjentów ortodontycznych. **Materiał i metody.** W badaniu retrospektywnym przeanalizowano teleradiogramy boczne głowy i modele diagnostyczne wykonane przed leczeniem ortodontycznym u 714 pacjentów ze średnią wieku 15,36 ± 2,12 lat. Pacjentów podzielono na 9 podgrup zależnie od wad zgryzu w płaszczyźnie strzałkowej i wzorców pionowego wzrostu. Zmierzono wymiary mezjodystalne zębów przednich, określono stosunek międzyszczękowy i wielkość zębów oraz wady zgryzu. **Wyniki.** Łącznie dla wad zgryzu

Abstract

Proportionality of the maxillary and mandibular teeth is a key factor for an ideal intercuspation at the end of orthodontic treatment. **Aim.** The aim of this study was to compare the anterior tooth size ratios and the prevalence of discrepancies among different craniofacial growth patterns in an orthodontic population. **Material and methods.** The retrospective study examined cephalograms and pre-orthodontic study models of 714 patients with a mean age of 15.36 ± 2.12 years. Patients were divided into 9 subgroups according to skeletal sagittal malocclusions and vertical growth patterns. Mesiodistal dimensions of the anterior teeth were measured and the intermaxillary ratio and tooth size malocclusions were determined. **Results.** In total, Class III malocclusions had a higher Bolton ratio and prevalence of discrepancies compared to other malocclusions (p<0.01).

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klasy III stwierdzono wyższy współczynnik Boltona i częstość występowania rozbieżności w porównaniu z innymi wadami zgryzu (p<0,01). Nie zaobserwowano istotnych różnic pomiędzy poszczególnymi podgrupami z tą samą wadą zgryzu w płaszczyźnie strzałkowej o różnym wymiarze pionowym w odniesieniu do wartości wskaźnika Boltona i częstości występowania rozbieżności (p>0,05). Nie stwierdzono istotnej różnicy pomiędzy hipodywergentnymi wadami zgryzu klasy I, II i III w płaszczyźnie strzałkowej o pionowym wzorcu wzrostu (p>0,05), natomiast stwierdzono istotną różnicę pomiędzy podgrupami normodywergentnymi i hiperdywergentnymi w zakresie współczynników Boltona (p<0,05). Częstość występowania rozbieżności większych niż 2 SD była istotnie wyższa u osób z normodywergentnymi i hiperdywergentnymi wadami zgryzu klasy III w porównaniu do pozostałych pacjentów (p<0,05). **Wniosek.** Wzorzec pionowego wzrostu wpływa na współczynnik Boltona i częstość występowania rozbieżności w połączeniu z wadami zgryzu w płaszczyźnie strzałkowej. **(Yavan MA, Hamamci N. Ocena stosunków wielkości zębów w obu szczękach i rozbieżności w zależności od modelu wzrostu twarzoczaszki. Forum Ortod 2021; 17 (4): 278-85).**

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Słowa kluczowe: rozbieżność w wielkości zębów; analiza Boltona, wzorzec pionowego wzrostu

No significant difference was found between different vertical subgroups of the same sagittal malocclusion with regard to Bolton ratio and the prevalence of discrepancies (p>0.05). No significant difference was found among hypodivergent sagittal Class I, II and III malocclusions with vertical growth patterns (p>0.05), while a significant difference was detected between normodivergent and hyperdivergent subgroups with regard to Bolton ratios (p<0.05). The prevalence of discrepancies greater than 2 SD was significantly higher in individuals with normodivergent and hyperdivergent Class III malocclusions compared to other individuals (p<0.05). **Conclusion.** The vertical growth pattern affects Bolton ratio and the prevalence of discrepancies when combined with sagittal malocclusions. **(Yavan MA, Hamamci N. Evaluation of intermaxillary tooth size ratios and discrepancies according to craniofacial growth pattern. Orthod Forum 2021; 17 (4): 278-85).**

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Key words: tooth size discrepancy; Bolton analysis, vertical growth pattern

Introduction

Proportionality of the maxillary and mandibular teeth is a key factor for an ideal intercuspation at the end of orthodontic treatment. For this reason, the detection of possible tooth size discrepancies by orthodontists before the treatment is crucial for an accurate treatment planning and for obtaining the best possible treatment results. Orthodontists can plan interproximal stripping, restorations, or extractions to avoid the possible adverse effects of such discrepancies on treatment outcomes (1, 2).

Although various methods have been proposed for the assessment of interarch tooth size relationships, Bolton's method is the most well-known and widely used method in clinical studies, which allows the assessment of tooth size discrepancies through the analysis of mesiodistal tooth dimensions between maxillary and mandibular arches (3-7). Bolton evaluated 55 cases with 'perfect' occlusion and determined an ideal mean anterior ratio of 77.2% ± 1.65% after assessing the dimensions of anterior teeth in maxillary and mandibular arches (6, 7).

It has been reported that tooth size, which is known to be associated with genetic and environmental factors, can differ between men and women, as in many other human characteristics (8-10). In addition, differences between ethnicities and gender with regard to tooth size ratio have also been investigated in numerous studies (2, 9, 11-15).

There is no consensus in the literature regarding the existence of a relationship between different malocclusions (Class I, II, and III) and Bolton tooth size ratio or tooth size discrepancies. While some researchers reported no significant difference in the prevalence of tooth size discrepancies among the three orthodontically treated groups, many other studies reported significant differences in tooth size ratios or the prevalence of discrepancies among the three malocclusion types (5, 8, 9, 14-20). Some of these studies classified the malocclusions based on the relationship between the maxillary and mandibular molar teeth as described by Angle, while others classified them by merging Angle's classification of dental malocclusions with the skeletal classification determined by the ANB angle (1, 5, 8, 9, 15, 16, 18, 20-22).

All the studies in the literature have mainly focused on the effects of sagittal malocclusions on tooth size discrepancies, whereas, to our knowledge, there has been no study reporting on the contribution of individuals' vertical orientation problems to these discrepancies. The aim of this study was to compare different craniofacial growth patterns and anterior tooth size ratios and to determine whether the growth pattern is a contributing factor to the prevalence of tooth size discrepancies. Moreover, unlike other studies in the literature, the study also aimed to examine anterior tooth size ratios and the prevalence of tooth size discrepancies in subgroups formed according to both sagittal malocclusion types and vertical growth patterns.

Material and methods

Materials

The retrospective study included individuals who applied to Adıyaman University, Faculty of Dentistry Department of Orthodontics for orthodontic treatment and had a cephalogram and an initial study model between 2012 and 2021. All patients were aged 12-18 years and were born and living in southeast Turkey. The study was initiated after obtaining an approval from Adıyaman University Research Ethics Committee (No: 2021/06-05).

Sample size was calculated using G*Power statistical software (G*Power Ver. 3.0.10, Kiel, Germany). For One-Way ANOVA test, the effect size was calculated using Cohen's f coefficient of 3.1022 and the effect size was found to be 0.34. Using an alpha error of 0.05 and 80% power, the required minimum sample size per group was determined as 28. To increase the power of the study, a total of 714 individuals were included in the study and thus a minimum 30 subjects were included into each group.

Participants were grouped according to their craniofacial growth patterns. Steiner's ANB angle was used for the detection of skeletal malocclusions in sagittal direction and the SN-GoGn angle was used for the assessment of vertical growth pattern. All participants were divided into three groups according to Angle's classification of malocclusion corresponding with their skeletal relationship: Class I (0°< ANB <4°), Class II (ANB >4°), and Class III (ANB <0°). Each group was then divided into three subgroups according to the SN-GoGn angle: hypodivergent (SN-GoGn <26°), normodivergent (26°< SN-GoGn <38°), and hyperdivergent (SN-GoGn >38°).

The selection criteria for study models were as follows: good quality, full eruption of all permanent teeth between first molars, absence of congenital deformities in the teeth, no previous orthodontic treatment, absence of excessive mesiodistal or occlusal abrasion, fractures, dental caries, interproximal restorations leading to changes in the original tooth size, any kind of prosthetic rehabilitation, and the absence of blisters or fractures in casts that could interfere with mesiodistal width measurements of all permanent teeth up to the first molars.

Methods

A digital caliper with 0.01 mm precision was used to measure the mesiodistal diameters of the teeth. All the measurements were performed by a single examiner who was properly calibrated (M.A.Y). The widest mesiodistal dimension of each tooth was measured and recorded from the distal surface of the left canine to the distal surface of the right canine in the maxillary and mandibular arches. Anterior tooth size ratios and discrepancies were assessed using the method described by Bolton (6). Anterior tooth size ratio was calculated by dividing the total widths of all 6 anterior maxillary teeth with the total widths of all 6 anterior mandibular teeth multiplied by 100: Sum of mandibular '6' / Sum of maxillary '6' x 100. Tooth size discrepancy was calculated with the following formulas according to whether the discrepancy was in the maxilla or mandible: if the anterior ratio was greater than 77.2, (Sum of mandibular '6') - (77.2% x Sum of maxillary '6'); if the anterior ratio was less than 77.2, (Sum of maxillary '6') - (Sum of mandibular '6'/ 77.2%).

To assess the method error, 100 out of 714 study models were randomly selected and re-measured by the same examiner at 1-month intervals. Dahlberg's formula was used to determine the size of random errors and t-test was used to detect systematic error. The selected 100 models were also measured by a second researcher (N.H.) to assess interrater reliability.

Statistical analysis

Data were analyzed using SPSS for Windows (Armonk, NY: IBM Corp.). Normal distribution of data was assessed using Shapiro-Wilk test. Descriptives were expressed as mean ± standard deviation (SD). In addition, ±1 or ±2 SD frequencies of the amount of discrepancies were given according to malocclusions and genders. Independent samples t-test was used for comparing anterior Bolton ratios between the genders, and analysis of variance (One-way ANOVA) was used for comparing the ratios among malocclusions. Chi-square test was used for comparisons between groups of nonparametric data. Dahlberg's formula was used to determine the size of random errors and t-test was used to detect systematic error. A p value of <0.05 was considered significant.

Results

The intra- and inter-rater reliability coefficients of repeated measurements were close to 1 (0.983 and 0.920, respectively) and the size of random errors was in the range of 0-0.16 for the sum of six mandibular and maxillary teeth and no systematic error was observed (p>0.05).

Table 1 presents a comparison of demographic and clinical characteristics of the patients. No significant difference was found between the groups with regard to mean age and gender distribution (p>0.05 for both).

Table 2 presents a comparison of tooth size ratios and discrepancies between the genders. Mean tooth size was 79.04±2.59, which was 79.32 ± 2.69 for males and 78.91±2.53 for females. No significant difference was found between

Table 1. Demographic characteristics

		Age	P[a]	Gender		P[b]
				Male	Female	
Class I	Hypodivergent	15.82±1.78		11	28	
	Normodivergent	15.24±2.26		30	99	
	Hyperdivergent	15.16±2.06		19	40	
Class II	Hypodivergent	15.40±2.26		21	33	
	Normodivergent	15.47±2.06	0,513	69	152	0,289
	Hyperdivergent	15.42±2.13		38	76	
Class IIII	Hypodivergent	15.54±2.24		14	17	
	Normodivergent	14.75±1.92		13	24	
	Hyperdivergent	15.36±2.12		7	23	

a: One-way ANOVA, b: Chi-Square test

Table 2. Comparison of tooth size ratios and discrepancies between the genders

		Female	Male	Total	P
Anterior tooth size ratios	Total (mean ± SD)	78.91±2.53	79.32±2.69	79.04±2.59	0.051 †
	Class I Hypodivergent	78.52±2.37	79.37±2.52	78.76±2.41	0.329 †
	Class I Normodivergent	79.02±2.56	78.98±2.36	79.01±2.51	0.932 †
	Class I Hyperdivergent	78.06±2.41	78.71±2.29	78.27±2.37	0.334 †
	Class II Hypodivergent	79.57±2.40	79.43±3.50	79.51±2.85	0.860 †
	Class II Normodivergent	78.56±2.52	79.12±2.54	78.73±2.53	0.130 †
	Class II Hyperdivergent	79.20±2.83	79.19±2.83	79.20±2.31	0.989 †
	Class III Hypodivergent	79.68±3.34	79.66±2.67	79.67±3.01	0.988 †
	Class III Normodivergent	79.43±2.64	80.97±2.77	79.67±3.01	0.105 †
	Class III Hyperdivergent	79.80±3.30	81.15±2.44	80.11±3.13	0.328 †
>1 SD	Normal (n, [%])	234 (47.6)	89 (40.1)	323 (45.2)	0.063 [b]
	>1 SD Discrepancy (n, [%])	258 (52.4)	133 (59.9)	391 (54.8)	
>2 SD	Normal (n, [%])	410 (83.3)	177 (79.7)	587 (82.2)	0.244 [b]
	>2 SD Discrepancy (n, [%])	82 (16.7)	45 (20.3)	127 (17.8)	

†: Student t test, b: Chi-Square test, SD: Standard deviation

the genders and among their subgroups with regard to tooth size (p>0.05 for all). A tooth size discrepancy greater than 1 SD was detected in 54.8% of patients, while this rate was 59.9% in males and 52.4% in females. A tooth size discrepancy greater than 2 SD was detected in 17.8% of patients and this rate was 16.7% in women and 20.3% in men. The prevalence of tooth size discrepancies greater than 1 and 2 SD showed no significant difference between males and females (p>0.05).

Table 3 presents the growth patterns of tooth size ratios in sagittal and vertical directions and the comparison of different sub-vertical groups with the same sagittal growth pattern. Table 4 presents a comparison of different sagittal groups with the same vertical growth pattern. No significant difference was found among the subgroups of the same sagittal malocclusions with different vertical growth patterns (p>0.05). Regardless of the vertical growth pattern, the mean tooth size ratio was 78.78±2.46 in Class I, 78.98±2.53 in Class II and 79.92±2.93 in Class III malocclusions and a significant difference was found among the three groups (p<0.05). Although no significant difference was found between Class I and II malocclusions (p>0.05), the anterior ratios in Class III malocclusions were significantly higher than those in Class I and II malocclusions (p<0.01). In sagittal malocclusions, no significant difference was found among hypodivergent Class I, II and III malocclusions with a sagittal growth pattern (p>0.05), whereas a significant difference was established between normodivergent Class II and III and hyperdivergent class I and III malocclusions (p<0.05).

Table 5 and 6 present the frequencies and percentages of Bolton tooth size discrepancies greater than 1 and 2 SD in malocclusions with sagittal and vertical growth patterns. No significant difference was found in the prevalence of discrepancies greater than 1 and 2 SD among the subgroups with the same sagittal malocclusions (p>0.05). Discrepancies greater than 1 SD were detected in 51.55% of Class I malocclusions, in 53.48% of Class II malocclusions, and in 67.35% of Class III malocclusions irrespective of the vertical growth pattern. Discrepancies greater than 2 SD were detected in 11.90% of Class I malocclusions, in 17.23% of

Table 3. Comparison of Bolton's anterior tooth size ratios and vertical subgroups of sagittal malocclusions among craniofacial growth patterns

	Hypodivergent (mean ± SD)	Normodivergent (mean ± SD)	Hyperdivergent (mean ± SD)	P [b]
Class I	78.76±2.41	79.01±2.51	78.27±2.37	0.160
Class II	79.51±2.85	78.73±2.53	79.20±2.31	0.069
Class III	79.67±3.01	79.97± 2.75	80.11±3.13	0.840

a: One-way ANOVA

Table 4. Comparison of Bolton's anterior tooth size ratios among sagittal skeletal malocclusions

	Class I (mean ± SD)	Class II (mean ± SD)	Class III (mean ± SD)	P [a]	I vs II [µ]	I vs III [µ]	II vs III [µ]
Total	78.78±2.46	78.98±2.53	79.92±2.93	0.001**	NS	**	**
Hypodivergent	78.76±2.41	79.51±2.85	79.67±3.01	0.312	NS	NS	NS
Normodivergent	79.01±2.51	78.73±2.53	79.97± 2.75	0.023 *	NS	NS	*
Hyperdivergent	78.27±2.37	79.20±2.31	80.11±3.13	0.003 **	NS	**	NS

*a: One-way ANOVA, µ: Bonferroni test, SD: Standard deviation, *: P < 0,05, **: P < 0,01.*

Table 5. Comparison of the prevalence of Bolton's tooth size among craniofacial growth patterns and vertical subgroups of sagittal malocclusions

		Hypodivergent		Normodivergent		Hyperdivergent		P [b]
		n	%	n	%	n	%	
Class I	Normal	24	61.53	57	44.18	29	49.15	0.163
	>1 SD Discrepancy	15	38.47	72	55.82	30	50.85	
	Normal	34	87.17	111	86.04	55	93.22	0.363
	>2 SD Discrepancy	5	12.83	18	13.96	4	6.78	
Class II	Normal	24	44.44	108	48.86	49	42.98	0.561
	>1 SD Discrepancy	30	55.56	113	51.14	65	57.02	
	Normal	40	74.07	184	83.26	98	85.96	0.156
	>2 SD Discrepancy	14	25.93	37	16.74	16	14.04	
Class III	Normal	11	35.48	14	37.83	7	23.33	0.417
	>1 SD Discrepancy	20	64.52	23	62.17	23	76.67	
	Normal	22	70.97	24	64.86	19	63.33	0.797
	>2 SD Discrepancy	9	29.03	13	35.14	11	36.67	

b: Chi-Square test, SD: Standard deviation

Class II malocclusions, and in 33.67% of Class III malocclusions irrespective of the vertical growth pattern and a significant difference was found among the three types of malocclusions (p<0.05). Although no significant difference was found between Class I and II malocclusions, the prevalence of Class III malocclusions was significantly higher than those of Class I and II malocclusions (p<0.05). Similarly, no significant difference was found among the prevalence of hypodivergent, normodivergent, and hyperdivergent growth patterns in sagittal discrepancies greater than 1 SD, while the prevalence of discrepancies greater than 2 SD in normodivergent and hyperdivergent Class III malocclusions was significantly higher than those of Class I and II malocclusions.

Discussion

In the present study, the mean anterior tooth size ratio of all individuals (n=714; 100%) was 79.04 ± 2.59, which was higher than the normal ratio proposed by Bolton (77.20 ± 1.65) (7). This difference seems plausible since the study only included patients who presented for orthodontic treatment. Uysal and Sari evaluated individuals with normal occlusion in a similar population and reported this ratio as 78.26 ± 2.61, which was within the normal range proposed by Bolton (14). In contrast, among the studies that evaluated Class I, II and III malocclusions together as in our study, Fattahi et al., Alkofide and Hashim, and Nie and Lin reported similar rates to that of our study (79.01 ± 2.8, 78.86 ± 2.55, and 81.52 ± 2.82, respectively) (15, 20, 23). The difference

Table 6. Comparison of the prevalence of Bolton's tooth size discrepancies among skeletal malocclusions

		Class I		Class II		Class III		P^{b}	I vs II	I vs III	II vs III
		n	%	n	%	n	%				
Total	Normal	110	48.45	181	46.52	32	32.65	0.024	NS	**	*
	>1 SD Discrepancy	117	51.55	208	53.48	66	67.35				
	Normal	200	88.10	322	82.77	65	66.33	0.000	NS	***	***
	>2 SD Discrepancy	27	11.90	67	17.23	33	33.67				
Hypodivergent	Normal	24	61.53	24	44.44	11	35.48	0.079	NS	NS	NS
	>1 SD Discrepancy	15	38.47	30	55.56	20	64.52				
	Normal	34	87.18	40	74.08	22	70.97	0.201	NS	NS	NS
	>2 SD Discrepancy	5	12.82	14	25.92	9	29.03				
Normodivergent	Normal	57	44.18	108	48.86	14	37.83	0.390	NS	NS	NS
	>1 SD Discrepancy	72	55.82	113	51.14	23	62.17				
	Normal	111	86.04	184	83.26	24	64.86	0.010	NS	**	***
	>2 SD Discrepancy	18	13.96	37	16.74	13	35.14				
Hyperdivergent	Normal	29	49.15	49	42.98	7	23.33	0.061	NS	NS	NS
	>1 SD Discrepancy	30	50.85	65	57.02	23	76.67				
	Normal	55	93.22	98	85.96	19	63.33	0.001	NS	***	**
	>2 SD Discrepancy	4	6.78	16	14.04	11	36.67				

*b: Chi-Square test, *: P < 0,05, **: P < 0,01, ***: P < 0,001*

between the anterior ratios reported in our study and those reported in other studies could be attributed to ethnic and racial characteristics of participants and the higher prevalence of morphological changes in the tooth width of upper incisors, particularly of lateral incisors (2, 11-13, 15, 24-28).

In line with the relatively higher anterior ratios obtained in our study, the prevalence of discrepancies greater than 1 SD was found to be 54.8% in all individuals. This rate is higher than those reported by Richardson and Malhotro (33.7%) and Bolton (7) (29%), while it is similar to the rate reported in the study by Araujo and Soukin (56%), which, in a similar way to our study, evaluated individuals with skeletal and dental malocclusions that applied for orthodontic purposes (8, 26). Crosby and Alexander proposed that the presence of an anterior tooth size discrepancy equal to or greater than 2 mm SD may affect the course of orthodontic treatment and also noted that the rate of such discrepancies was 22.9% in their population (17). The same rate was reported as 30% by Freeman et al., 28% by Santoro et al., and 22.7% by Araujo and Souki (2, 8, 28). This rate was determined as 17.8% in the present study and it was reported as 21.3% in the study by Uysal and Sari which showed similar ethnic characteristics to those of our study (14).

Many researchers, in a similar way to our study, have reported that there is no sexual dimorphism in the prevalence of anterior tooth size discrepancy, while others have reported differences between the sexes (1, 2, 5, 8, 13-16, 20, 22, 23, 26). This contradiction could be associated with the ethnic differences of the participants included in the studies.

In our study, no significant difference was found between skeletal Class I (78.78±2.46) and II (78.98±2.53) malocclusions with regard to anterior tooth size ratio, while the mean anterior tooth size ratio in Class III malocclusions (79.92±2.93) was significantly higher than those of Class I and II malocclusions (p<0.05). There is no consensus in the literature regarding the effect of sagittal skeletal malocclusions on the anterior tooth size ratio. Endo et al. and Basaran et al., contrary to the findings in our study, reported no effect in Japanese and Turkish populations, respectively, while Araujo and Souki, in a similar way to our study, showed a significant relationship among malocclusions with regard to anterior tooth size ratio (Class III > Class I = Class II) in Brazilian individuals (5, 8, 16). Nie and Lin, Fattahi et al., and Wedrychowska-Szulc et al. also indicated that the anterior tooth size ratios of Class III malocclusions were significantly higher than those of other malocclusions in Chinese, Iranian, and Polish populations, respectively (15, 20, 22). As an explanation to this significant difference, Lavelle showed that the maxillary teeth in individuals with Class III malocclusions were smaller compared to those of individuals with Class I and II malocclusions, and Araujo and Souki suggested that this difference was as a result of the accumulative effect on minor tooth size differences in Class III individuals (8, 24). The role of genetics in Class III malocclusions, particularly in mandibular prognathia, is a well-known phenomenon (29). Sassouni reported that individuals with insufficient maxillary growth have a higher prevalence of changes in the shape of the anterior teeth as well as a higher incidence of agenesis (30).

In our study, the prevalence of discrepancies greater than 1 and 2 SD was found to be significantly higher in Class III malocclusions (67.35% and 33.67%, respectively) compared to other malocclusions. We consider that such a high prevalence of discrepancies greater than 2 SD may affect the course of orthodontic treatment and thus warrants clinical attention for the diagnosis of individuals with Class III malocclusions and also for achieving an ideal anterior occlusion by correcting the mesiodistal insufficiency in maxillary teeth or the mesiodistal outgrowth in mandibular teeth within the treatment planning (17).

Vertical growth patterns of individuals are an important factor affecting the prognosis. In Class II and III malocclusions, hypodivergent and normodivergent growths are a facilitating factor for the treatment, while increased hyperdivergence is an important factor reducing the predictability of treatment outcomes (31). Literature indicates that the vertical ratios are under high genetic control and the most common inherited facial deformity is open bite malocclusion with dolichofacial pattern (32). Similarly, Manfredi et al. evaluated the genetic characteristics of orthodontic cephalometric parameters and suggested that vertical parameters are more genetically controlled than anteroposterior parameters (33). In the studies examining the effects of sagittal skeletal malocclusions on tooth size discrepancy, it can be seen that no standardization has been established for such an important genetic factor related to malocclusions (5, 8, 15, 16, 20-22). In the present study, the comparison of the hypodivergent, normodivergent, and hyperdivergent subgroups in Class I, II, and III malocclusions indicated that the growth pattern alone may have no effect on anterior tooth size ratio and on the prevalence of discrepancies. However, the comparison of Class I, II and III malocclusions with regard to vertical growth patterns showed interesting results, whereby no significant difference was found between the anterior tooth size ratios and the prevalence of discrepancies in hypodivergent Class I, II and III malocclusions. Nevertheless, a significant difference was observed between normodivergent Class II and III malocclusions and hyperdivergent Class I and III malocclusions with regard to tooth size ratio. These findings suggest that the vertical growth pattern, which may not have a significant effect on tooth size ratios per se, can affect tooth size ratio when combined with sagittal malocclusions and also implicate that the differentiation in the results obtained in previous studies regarding sagittal malocclusions may be due to the vertical patterns of malocclusions.

Major limitation of this study, as in other cross-sectional studies, is that it included a specific population that consisted of individuals who applied only for orthodontic treatment. Accordingly, further studies may evaluate Bolton tooth size malocclusions in larger patient groups that do not need orthodontic treatment by grouping the individuals according to their craniofacial patterns.

Conclusion

1. Combination of vertical growth pattern with sagittal malocclusions may affect tooth size ratio and the prevalence of discrepancies.
2. It was revealed that individuals with hyperdivergent Class III malocclusions have higher anterior tooth size ratios and a higher prevalence of discrepancies greater than 2 SD.
3. A higher prevalence of tooth size discrepancies was observed in Class III malocclusions compared to other malocclusions.
4. No significant difference was found between the sexes with regard to anterior tooth size ratio and the prevalence of discrepancies.

Piśmiennictwo / References

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