

Dentometric Characteristics of Examinees with Primary Crowding

Dentometrijske karakteristike ispitanika s primarnom kompresijom

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Summary

A comparative study of dentometric characteristics of incisors in the upper and lower jaws was performed in an attempt to determine the role of the size of the mentioned teeth in the process of primary crowding.

The study included 200 examinees (140 females and 60 males) with primary crowding and 100 eugnathic subjects (48 females and 52 males) as a control group. The sample was selected according to the following criteria: anterior crowding, completed exchange of teeth, neutral intermaxillary relationship (Angle class I), lack of other malocclusion. The age was limited to 14 years in order to avoid the possible influence of tertiary crowding. The study was carried out by means of a sliding-caliper with 1 mm precision on plaster casts of the upper and lower jaws, and the mesiodistal diameters of all the four permanent incisors in the upper and lower jaws were measured. After statistical analysis and interpretation of the results, the following was concluded:

Arithmetical means of the sums of the upper incisors were considerably higher in boys, while the difference between the mean values of the sums of the lower incisors was insignificant. The subjects with crowding had significantly bigger upper but not lower incisors. One of the important factors for the occurrence of crowding were bigger incisors, especially the upper central ones, and in girls also the lower incisors. The size of the incisors should by no means be taken as the only cause of crowding, as demonstrated by the analysis of the widths and heights of the upper dental arch. Significantly smaller widths of dental arches in the premolar and molar regions, along with an increase in the anterior upper height were registered in the subjects with crowding. The analysis of correlations revealed only a slight association between the size of incisors, especially the upper ones, and the widths and anterior heights of the upper dental arch, possibly indicating a very low correlation or the lack of correlation among the factors inducing crowding, i.e. increase in the size of incisors, and a narrower and longer upper dental arch.

Key words: primary crowding, permanent dentition, odontology, dimensions of incisors

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Coronary crowding in the anterior part of one or both dental arches is the most frequent malocclusion of civilized and urbanized populations (1-5). It has been evolutionary conditioned by a continued reduction of maxilla and mandible, through indirect or direct genetic influence, as well as through inadequate circumstances of development together with the decline of orofacial functions (3,6,7).

Most of the findings of this type start to manifest during the growth of permanent incisors, and are called »primary crowding« (8). In about 10% of cases, primary crowding occurs in primary dentition and is then transferred, apart from rare exceptions, onto permanent teeth (9).

The main symptom is crowding of incisors accompanied by an insufficient transversal development of dental arches, while other pathologic findings, such as changes within intermaxillary relations, may be present as a consequence of a strongly pronounced basic anomaly or as a result of an additional influence of another malocclusion.

The dimension of incisors and its role in the occurrence of primary crowding, is a question which many authors have tackled. Thus, LUNDSTROM (10) believes that the size of teeth grows with the intensity of crowding. DORIS et al. (11) and DUKIĆ-HOMAN (12) report that the subjects with crowding have bigger incisors, EJDUS-POPOVIĆ (13) that the frequency of crowding increases with the size of teeth, while GERLACH (14) states that the cause of a certain number of crowdings is a great increase in the incisor dimensions. On the other hand, there is data indicating a predominant influence of a deficient transversal development of dental arches on the size of teeth (15-17).

To elucidate the dilemma, we decided to examine the dentometric characteristics of the upper and lower jaw incisors in a strictly selected sample of subjects with primary crowding, and to compare the results with the respective measurements performed in a sample of eugnathic subjects.

Subject and Method

Dentometric examination included 200 subjects (140 females and 60 males) with primary crowding, and 100 eugnathic subjects (48 fema-

les and 52 males), serving as a control group. A dysgnathic part of the sample was obtained by rigorous selection of patients treated at the Department of Orthodontics of the School of Dentistry in Zagreb.

The sample was selected according to the following criteria: anterior crowding, completed exchange of teeth, neutral intermaxillary relationship (Angle class I) and absence of other orthodontic anomalies. The subjects' age was limited to 14 years, to avoid the possible influence of tertiary crowding. The subjects were supposed to have undergone no previous orthodontic treatment. The eugnathic part of the sample consisted of the Zagreb elementary school pupils.

Each subject had his alginate impressions of the upper and lower dental arches taken, his intermaxillary relation fixed in wax, and his plaster casts with completed odontometric measurements made. By means of a sliding-caliper with 0.5 mm precision and applying a double check method, the mesiodistal diameters of all permanent incisors in the maxilla and mandible were measured. Results are presented in total and for each group separately, as well as according to sex.

Statistical analysis was carried out on a computer by means of the STATGRAPH 5.0. software.

Results and Discussion

There was an evident disproportion in the number of study subjects according to sex (60 : 140), merely due to random selection, which, however, may have misled to a hypothesis that crowding was more frequent in females, by about 20%, than in males. Comparison of the arithmetical means of mesiodistal diameters of homonymous teeth on the right and left sides revealed minimal differences not exceeding 0.10 mm, which are statistically insignificant (Fig. 1).

Comparison of the two sex-groups produced higher values in boys, with difference absolutes ranging between 0.02 to 0.24 mm. These differences were statistically significant, at levels of 1% (for the upper right central incisors and lower left lateral incisors) and 5%, except for the lower central incisors and upper left lateral incisors. Arithmetical means of the sums for the

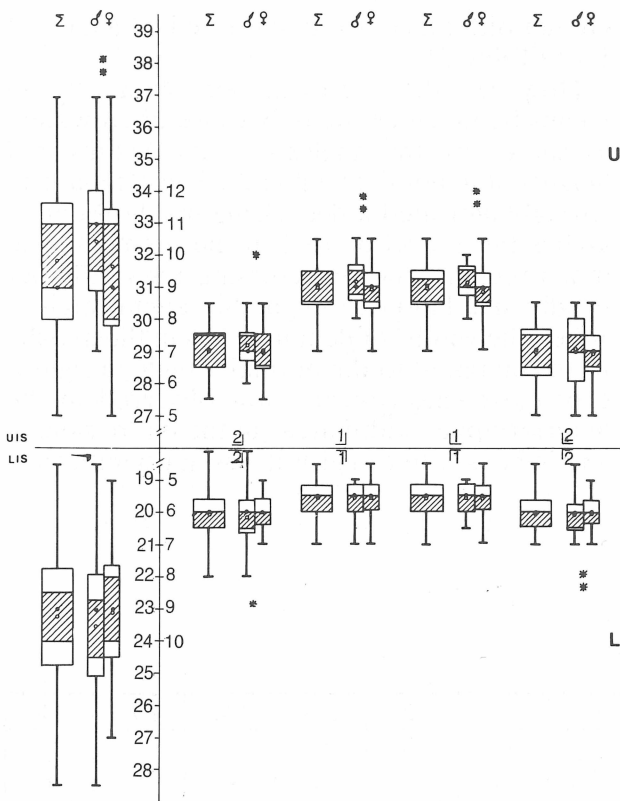


Figure 1. Comparison of means of mesiodistal diameters of homonymous left and right incisors

Slika 1. Usporedba aritmetičkih sredina najvećih meziodistalnih promjera istoimenih zubi desne i lijeve strane

upper incisors were considerably higher (at a level of 1%) in boys (absolute difference, 0.87 mm), while the difference between the mean values of the sums for the lower incisors was insignificant (0.42 mm).

The variability was the lowest with the sum of the upper incisors (especially in boys), and the upper central incisors, and the highest for the upper left lateral incisors and lower right lateral incisors in boys. The girls had lower variability of the lower lateral incisors.

Comparison of the arithmetical means of the sums of the upper incisors with the results obtained in eugnathic subjects (N=18), suggested that the children with crowding had significantly bigger upper incisors (at levels of 5% and 1%), while the sum of the lower incisors in the entire sample (N=18) did not show any significant difference. Differences in individual incisors between the sample with crowding and eugnathic subjects according to sex, and the significance of the above mentioned deviations, are presented in Table 1. Significant differences in dimensions of the upper central incisors for both sex-groups ($p < .01$), and of the lower central incisors (and the lower right lateral incisors) in girls ($p < .01$), are observed, also entailing a significant difference in the width of the lower sum of incisors in girls (at a level of 1%), and, in spite of significant differences in the width of the upper central incisors in boys, no significant difference is indicated in the upper sum of incisors due to slightly smaller lateral incisors in the sample with crowding.

In conclusion, bigger incisors, primarily the upper central ones, appear to be one of the important factors for the occurrence of crowding in boys. In girls, the same role of lower incisors should also be considered. The hypothesis was confirmed by comparison with the group of normal subjects (668 age-matched children free of any symptoms of malocclusion, in whom even

Table 1. Differences between incisors in »crowding« and eugnathic groups according to sex

Tablica 1. Razlike između pojedinačnih sjekutića uzorka s kompresijom i eugnatih ispitanika prema spolu te značajnost navedenih odstupanja

$X_C - X_E$	2]	1]	[1	[2	2]	1]	[1	[2	UIS	LIS
MALE	-.01	.30	.31	-.03	.06	.12	.02	.02	.64	.22
FEMALE	.00	.31	.29	.07	.15	.21	.18	.02	.66	.54

* = < .05
** = ≤ .01

Table 2. Differences in dimensions between upper and lower incisors and between dental arches in crowding and normal groups

Tablica 2. Razlike dimenzija gornjih i donjih sjekutića te dimenzija zubnih lukova između obrađenoga uzorka i zdravih ispitanika

	UIS	LIS	AW	PW
Σ	0.87 **	1.25 **	0.86 **	-0.08
MALE	2.05 **	1.13 **	0.96 **	0.08
FEMALE	2.03 **	1.23 **	0.37	-0.66 *

greater differences were registered, at a level of 1%) (Table 2).

However, the size of incisors should by no means be taken as the only cause of crowding, as shown by the analysis of the widths and heights of upper dental arches. The comparison strongly indicated a decreasing width of dental arches (at a level of 1%) in the premolar and molar regions, and an increasing anterior upper height in relation to eugnathic dental arches. When the widths of dental arches in the maxilla were compared to the normal sample, a significant narrowing ($p < .01$) was observed in the anterior upper width area (in the entire sample and in boys, while in girls it was not significant).

Table 3. Correlations of dimensions of incisors and dental arches

Tablica 3. Korelacija dimenzija sjekutića i zubnih lukova

	2]	1]	[1	[2	UIS	2]	1]	[1	[2	LIS	AW	PW	AH
2]		.496 □	.500 □	.731 ■	.850 ■	.460 □	.452 □	.458 □	.505 □	.522 □	■	■	■
	1]		.941 ■	.385 ■	.849 ■	.597 □	.623 □	.633 □	.603 □	.687 □	■	■	■
		[1		.387 ■	.851 ■	.557 □	.586 □	.612 □	.593 □	.656 □	■	■	■
			[2		.682 □	.324 ■	.338 ■	.339 ■	.354 ■	.391 ■	.364 ■	.364 ■	.373 ■
				UIS		.610 □	.619 □	.628 □	.648 □	.698 □	.364 ■	.364 ■	■
					2]		.639 □	.645 □	.906 ■	.889 ■		■	
						1]		.932 ■	.647 □	.895 ■		■	
							[1		.674 □	.904 ■	■	■	■
								[2		.895 ■	■	■	■
									LIS		.239 ■	.335 ■	.242 ■
										AW		.730 ■	
											PW		
													AH

SIGNIFICANCE

- LOW
- MEDIUM
- HIGH

In the posterior width in males, no narrowing was observed, while in normal girls the width was even smaller ($p < .05$) (Table 2). This could be due to a larger number of »latent« crowdings in the sample, or because the sample of normal subjects was examined more than ten years ago, while the adolescent maximal growth may have occurred later (secular trend).

However, the analysis of correlations (Table 3) indicated a slight association between the size of the incisors, especially the upper ones, and the widths and anterior heights of the upper dental arch, possibly indicating a very low correlation, actually the lack of correlation, among the crowding-inducing factors, i.e. increase in the size of incisors, and a narrower and longer upper dental arch. The widths indicated a rat-

Conclusions

Based on the study results, the following was concluded:

- The arithmetical means of the sums of the upper incisors were considerably higher in boys, while the difference between the mean values of the sums of the lower incisors was insignificant.
- Important factors for the occurrence of crowding are: bigger incisors, especially the upper central ones, and in females the lower ones too.
- The size of the incisors can by no means be taken as the only cause of crowding, as demonstrated by the analysis of the upper dental arch widths and heights.

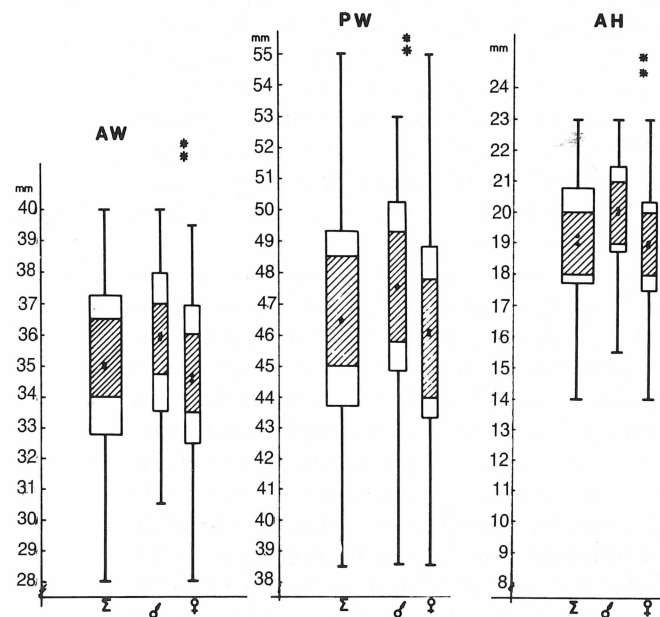


Figure 2. Analysis of upper dental arch widths and heights

Slika 2. Analiza širina i dužina gornjega zubnog niza

her significant mutual correlation, and so did the size of homonymous incisors too. The upper and lower incisors showed a significant intercorrelation (Fig 2) (except for the upper left lateral incisors, where the correlations were slight, and for the lower and central upper incisors).

- The subjects with crowding were found to have significantly smaller widths of dental arches in the premolar and molar regions and an increased anterior upper height.
- The correlations obtained indicated only a slight association between the size of inci-

sors, and the widths and anterior heights of the upper dental arch, possibly indicating a very low correlation or the lack of correla-

tion among the factors inducing crowding, i.e. increase in the size of incisors, and a narrower and longer upper dental arch.

DENTOMETRIJSKE KARAKTERISTIKE ISPITANIKA S PRIMARNOM KOMPRESIJOM

Sažetak

Provedeno je usporedno istraživanje dentometrijskih odlika sjekutića u gornjoj i donjoj čeljusti s ciljem utvrđivanja uloge veličine navedenih zubi u procesu nastajanja primarne kompresije.

Istraživanje je obuhvatilo 200 ispitanika (140 ženskih i 60 muških) s primarnom kompresijom i 100 eugnatih ispitanika (48 ženskih i 52 muška) koji su poslužili kao kontrolna skupina. Odabir je učinjen prema slijedećim mjerilima: zbijeni postav sjekutića, završena mijena zubi, neutralni međučeljusni odnos (K1 I), odsutnost neke druge ortodontske anomalije. Dob je ograničena na 14 godina, kako bi se izbjegao mogući utjecaj tercijarne kompresije. Istraživanje je provedeno pomičnom kliznom mjerkom s točnošću od 0,5 mm na sadrenim odljevima gornjih i donjih čeljusti, a izmjereni su meziodistalni promjeri svih gornjih i donjih trajnih sjekutića. Nakon provedene statističke obrade i analize rezultata, može se zaključiti slijedeće:

Aritmetičke sredine suma gornjih inciziva značajno su veće u dječaka, dok razlika između spolova za prosječne vrijednosti suma donjih inciziva nije značajna. Jedan od važnih čimbenika za nastajanje »crowdinga« je povećana zubna masa sjekutića, prvenstveno gornjih srednjih, a u djevojčica i donjih inciziva. Veličina inciziva nikako se ne može uzeti kao jedini razlog za nastanak kompresije, što potvrđuje i analiza širina i dužina gornjega zubnoga niza. U ispitanika s »crowdingom« zabilježene su značajno manje širine zubnih nizova u regiji premolara i molara te povećanje prednje gornje dužine. Analiza korelacija ukazuje tek na laganu povezanost ili nepovezanost veličine inciziva sa širinama i prednjom dužinom gornjega zubnog niza. To bi moglo ukazivati na vrlo malu povezanost, odnosno nepovezanost čimbenika koji dovode do »crowdinga«, a to su veći incizivi te uži i duži gornji zubni niz.

Ključne riječi: primarna kompresija, stalna denticija, odontometrija, dimenzije inciziva

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