Analysis of Developmental and Occlusal Characteristics of Primary Dention in Examinees with and Without Crowding of Permanent Teeth

Analiza razvoja i okluzalne karakteristike u primarnoj denticiji kod ispitanika sa i bez zbijenosti trajnih zubi

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Summary

The fact that crowding appears in a larger number of cases for the first time during the replacement of teeth does not exclude the possibility of an earlier appearance of certain indicators, on the basis of which a future malocclusion could be predicted.

In order to verify the stated hypothesis we decided to extract the factors which could be relevant to the development of crowding by means of analysis of qualitative and quantitative characteristics of primary dentition and by means of the evaluation of the influence of each individual feature on the spatial conditions in permanent dentition.

The sample consisted of 76 examinees of both sexes which were longitudinally surveyed throughout eight years. For each examinee the following characteristics were registered and evaluated: existence of primatical diastemas in the lower jaw, degree of abrasion, existence and degree of physiological diastemas in the upper jaw, condition of equidistal planes, sagital interrelation determined by canines, overbite, transversal interrelation and overjet.

After 8 years the examinees were divided into the group with crowding (51) and the group without crowding (25). The data were processed by the SAS software, for each group individually and compared mutually.

The established hypothesis regarding the existence of early symptoms relevant to the emergence of crowding of permanent teeth has received only partial confirmation in the conducted survey. From the findings analyzed it follows that the appearance of crowding is in the relation with the lack of physiological diastemas; the absence or early closure of the primatical diastema; the early loss of equidistal plane and caries or extraction of primary teeth.

A more favorable prognosis in preventing the appearance of crowding can be assigned to bigger physiological diastemas, the

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persistence of equidistal planes, the presence of primatical diastemas and intact primary teeth.

Key words: *crowding, occlusal characteristics, longitudinal study*

Introduction

Crowding appears in both dentitions, but the differences in the frequency and degree of its manifestation are considerable. In primary dentition the frequency of crowding is about 10% (1,2), which places the latter into a group of less frequent malocclusions. It is usually transferred continues into the mixed and permanent dentitions, although rare deviations towards eugnatics or other types of anomalies have been registered (3). In permanent dentition crowding becomes almost the common clinical finding, while the manifestation of the anomaly differs substantially (4–12). In a large number of cases it affects both dental arches, although the possibility of its appearance in only one jaw is not excluded. A greater frequency in the upper jaw is indicated by Haynes (7), while Burgesdijk et all. (4), Lavelle (13) and Helm (14) speak of a greater frequency in the lower jaw.

The data regarding the frequency of crowding in permanent dentition vary depending on sex, age, constitutional, ethnical, geographical, racial and environmental influences. (Table 1)

A number of authors report a greater frequency of crowding in females (8, 15, 16, 17), while Burgesdijk et all. (4) find it to be opposite.

With the appearance of crowding in adolescence (tertiary), the incidence grows considerably and can become twice as frequent (4,12). Proffit (9) and Korosuo et all. (12) indicate a greater frequency of crowding in Caucasians than in the black race.

The fact that crowding appears in a larger number of cases for the first time during the replacement of teeth does not exclude the possibility of an earlier appearance of certain indicators, on the basis of which a future malocclusion could be predicted. In order to verify the stated hypothesis we decided to extract the factors which could be relevant to the development of crowding by means of analysis of qualitative and quantitative characteristics of primary dentition and by means of the evaluation of the influence of each individual feature on the spatial conditions in permanent dentition.

Examinees and Methods

The sample consisted of 76 examinees of both sexes which were longitudinally surveyed throughout eight years. There were eight defined characteristics of primary dentition registered between ages five and six, namely, during the last check-up before the beginning of teeth replacement.

For each examinee the following characteristics were registered and evaluated:

- existence and degree of physiological diastemas in the upper jaw (0-none, 1-smaller diastemas between certain incisors, 2-smaller diastemas between all the incisors, 3-bigger diastemas between all the incisors);
- existence of primatical diastemas in the lower jaw (yes, no);
- degree if abrasion (0-none, 1-abrased cusps, 2-abrased larger parts of cusps, 3-completely abraded cusps);
- condition of equidistal planes (persisting, ruptured, combined record);
- sagital interrelation determined by canines (Angle class I, II, III, combinations);
- overbite (– open, 0- no overbite, 1- minimal overbite /1-2 mm), 2-normal overbite /3 mm/ and 3- deep overbite /3 mm and more/);
- transversal interrelation (cross bite: yes, no);
- overjet (+ positive, 0-tete a tete, 1-normal overjet (1 mm), 2 – (2 – 3 mm), 3 – (3 mm and more).

The examinees were reexamined between ages 12 and 13 and, based on clinical estimate and gnathometric finding, divided into the group with crowding (51) and the group without

crowding (25). The data were processed by the SAS software, for each group individually and compared mutually.

Results and Discussion

In Figure 1 the results of evaluation of the physiological diastema in primary dentition and their influence on the spatial conditions in the permanent dental arch are presented.

Physiological diastemas can occur very early, in the period of the eruption of the deciduous incisors and not change quantitatively due to a relatively small increase of circumference of the dental arches (18, 19). They can also appear later with a tendency to become bigger which again indicates the presence of a more intense transversal and sagital growth prior to the replacement of incisors (20, 21).

In both groups of examinees (with and without crowding) the most frequent were the diastemas of the first degree. However, between two groups of examinees certain differences have been registered. In the group with crowding one quarter of the examinees did not have a physiological diastema, while in the group without crowding there was not a single case without physiological diastema. Diastemas of the first degree were somewhat more frequent in the group with crowding, while the diastemas of the second and third degree were twice as frequent as in the group without crowding.

Regardless of the time of appearance of physiological diastemas, their absence could be regarded as an almost certain sign of crowding in permanent dentition. In contrast to that, the examinees with larger diastemas have a stronger chance of avoiding crowding.

In Figure 2 displayed separately in groups is the incidence of primatical diastemas in the lower jaw.

Primatical diastemas are the usual findings in primary dentition, while with the advance of age they show a tendency of closing (21).

In both groups a larger number of examinees had a primatical diastema at the time of registration. The frequency of positive results was nevertheless somewhat higher in the group without crowding (92:76.47%). However, the negative results were three times as frequent in the group with a later report of crowding as in the group without crowding. The findings of primatical diastemas in our examinees had proved prognostically more favorable for the esta-

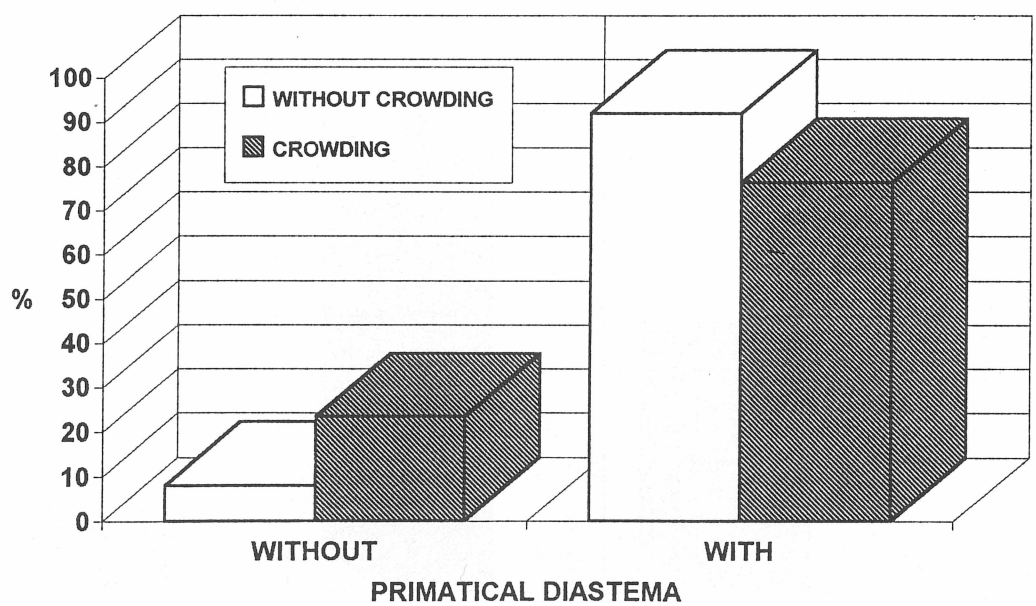

Figure 1. *Physiological diastemas in primary dentition and their influence on the spatial conditions in the permanent dental arch*

Slika 1. *Fiziološke dijasteme u mliječnoj denticiji i njihov utjecaj na prostorne uvjete u trajnom zubnom nizu*

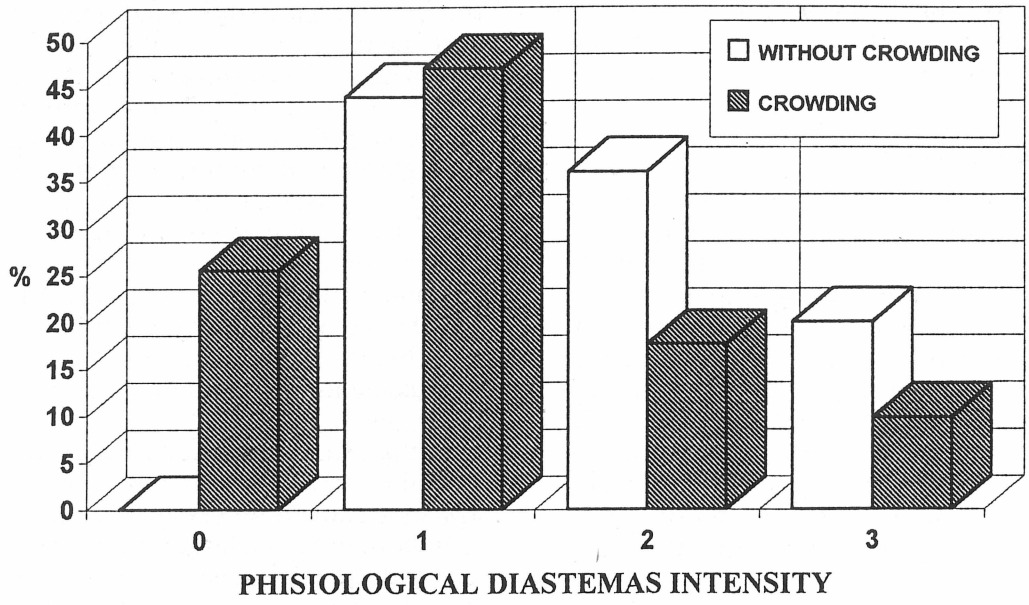

Figure 2. *Incidence of primatical diastemas in the lower jaw separately in groups*
Slika 2. *Incidencija primatnih dijastema u donjoj čeljusti po grupama*

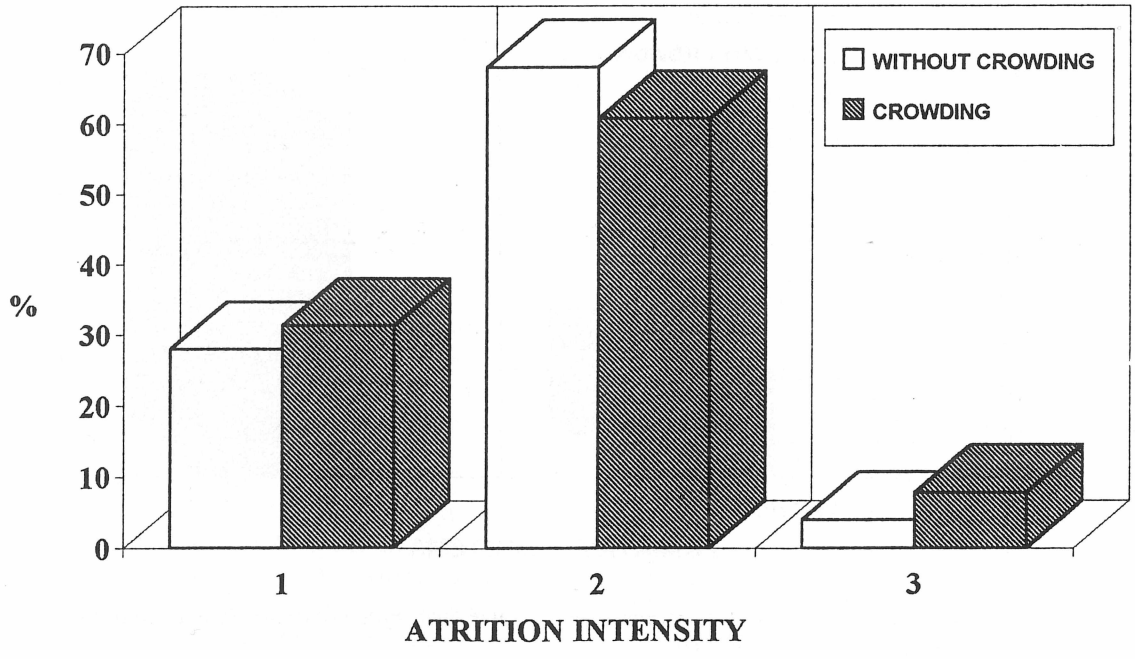

Figure 3. *Results of the evaluation of the deciduous teeth abrasion separately in groups*
Slika 3. *Rezultati evaluacije abrazije mliječnih zubi po grupama*

blishment of more normal spatial relations in the permanent dentition, but this does not exclude the occurrence of crowding. A three times more frequent negative report permits this fact to be included into the factors which contribute to the development of crowding.

In Figure 3 presented are the results of the evaluation of the deciduous teeth abrasion separately in groups.

Before the beginning of the replacement of teeth abrasion is a common phenomenon along with the differences in the degree of its prominence depending on the endogenous and exogenous factors. So far research has indicated that the intensity of abrasion progresses with age (21).

In both groups of examinees the most prevalent is the second degree abrasion, with a slightly greater frequency in examinees without crowding, while the abrasion of the third degree appears more frequently in the group with crowding.

Due to the fact that abrasion had been registered immediately prior to the beginning of the replacement of teeth, 63% of our examinees has the second degree abrasion. The differences in the intensity of abrasion were not pronounced enough to speak in favor of influence on the development of spatial conditions in the permanent dentition.

In Figure 4 displayed is the state of equidistal planes separately in groups. Equidistal planes can be maintained until the exchange of teeth or can be ruptured somewhat earlier due to the mesial shift of the lower deciduous molars (18, 19, 20, 21).

From this we should exclude the rare class III results or the more strongly expressed class II results, when they are ruptured from the beginning.

In a total of 56.58% of our examinees, the equidistal planes had been ruptured, and in the group with crowding more often, which speaks in favor of the hypothesis that the persistence of equidistal planes acts a great deal more positively on the formation of normal spatial relations in the permanent dentition.

In the group without crowding the equidistal planes persisted in 52% of the findings, while in the rest they were ruptured. In the group with crowding the negative results were more frequent (60.78%), and combinations were also registered (on the one hand the equidistal plane persisted, and on the other it was ruptured), therefore, in only one third of the examinees the equidistal planes persisted.

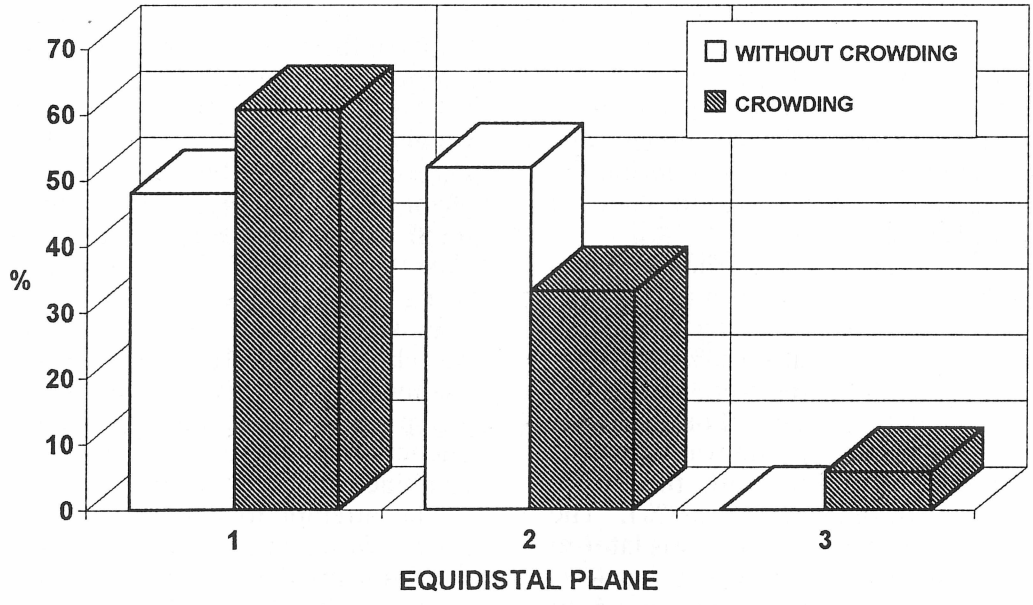

Figure 4. *State of equidistal planes separately in groups*
Slika 4. *Stanje ekvidistalne ravnine po grupama*

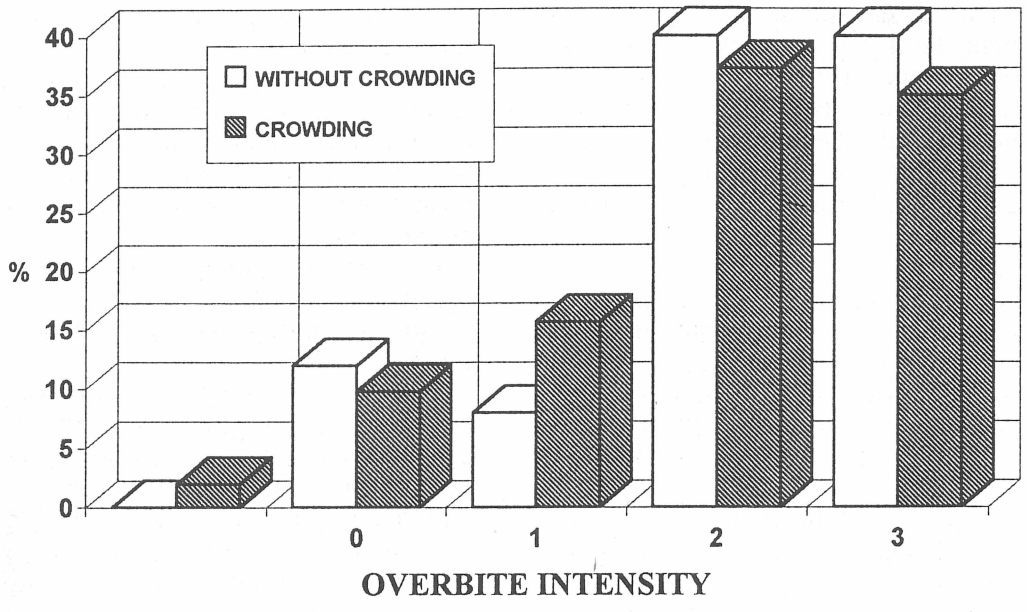

Figure 5. *Results of the evaluation of the vertical relation, separately in groups*
Slika 5. *Rezultati evaluacije vertikalnih odnosa po grupama*

The results of the evaluation of the vertical relation, separately in groups are displayed in Figure 5.

Along with the normal overbite the deep bite in primary dentition is so frequent that it should not always be considered as a pathological sign (19, 20, 21). Namely, smaller occlusal aberration according to the interpretation of Moorrees (23) may be considered as nothing but variations of the normal. A more shallow overlap of the incisors is prognostically not unfavorable either, because in most of the cases during the exchange of teeth it is transformed into a more normal form (24).

In both groups of examinees the most frequent were the findings of the normal and deep bites, the group without crowding containing slightly more of these results (80%:72.54%). The cases without overbite were somewhat more represented in the group without crowding (12%:9.8%). The small overbite was represented twice as much in the group with, than in the group without crowding (8%:15.69%). The single examinee with the open bite was later to be found in the group with crowding.

Although the findings of the normal and deep overlap in our examinees were more frequent in the group without crowding (80:72.25), and the findings of the shallow overlap two times more frequent in the group with crowding, it is difficult due to the heterogeneity of the remaining two forms to speak of the interrelationship of this parameter and the creation of special conditions in permanent dentition.

In Figure 6 the representations of certain forms of the sagital interrelation is displayed separately, in groups.

Class II or Class III relations in primary dentition are considerably less frequent than in permanent dentition, but all the forms are rather changeable. Namely, during the exchange of teeth about 50% of the cases move from one class to the other (24); the greatest stability being revealed by class I (24).

In the complete sample the most frequent was class I. Class III was registered in only one examinee, which is later to be found in the group without crowding. The differences in frequency between groups in class II as well as in combined findings are practically non-existent.

The attempt to determine the influence of certain forms of the sagital relation in primary dentition on the spacial conditions in permanent dentition did not give a positive result. Namely, the differences between groups were not evident.

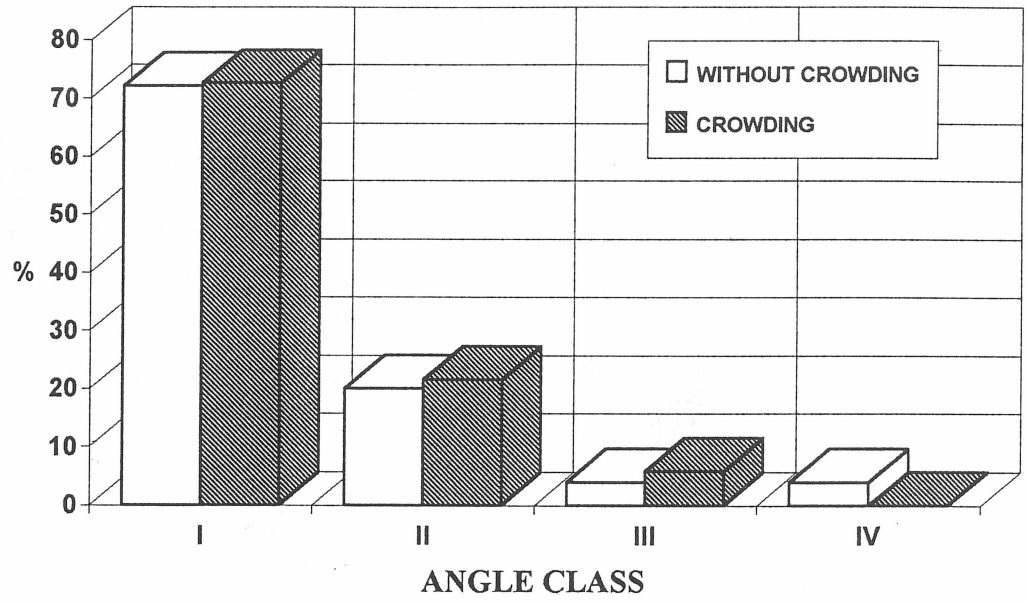

Figure 6. *Certain forms of the sagital interrelation separately, in groups*
Slika 6. *Sagitalni međučeljusni odnosi po grupama*

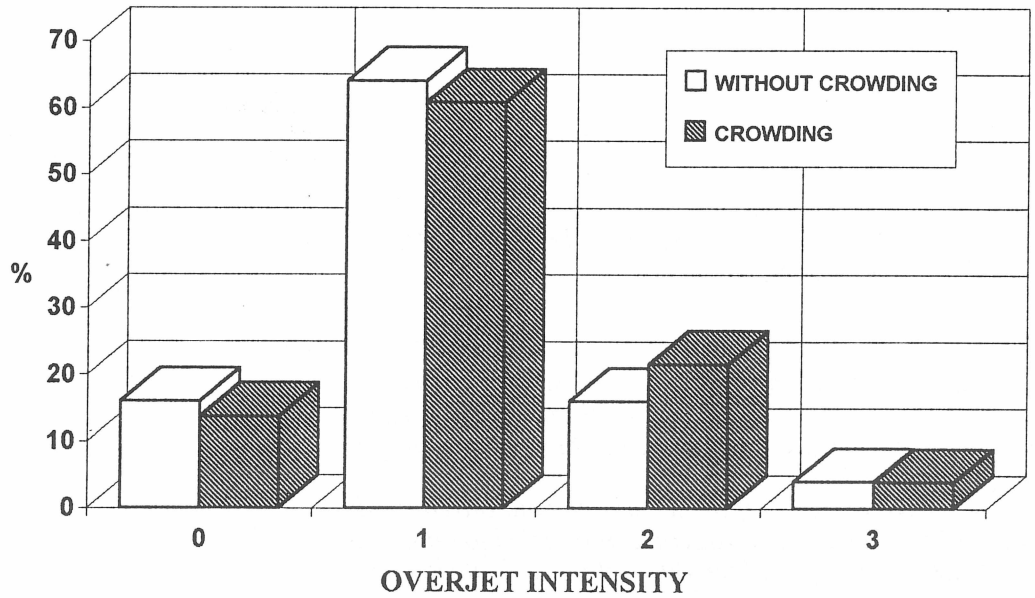

Figure 7. *Evaluation of the overjet in primary dentition, separately in groups*
Slika 7. *Evaluacija horizontalne incizalne stepenice u mliječnoj denticiji po grupama*

In Figure 7 presented are the results of the overjet in primary dentition, separately in groups.

The overjet in primary dentition belongs to the group of very variable features. With the advance of age bigger overjet become smaller, while the frequency of the normal overjet and edge-like bite grows (21).

In the largest number of examinees (61.84%) the appearance of normal overjets along with

relatively small scarce differences among groups has been registered. Slightly increased overjet was more present in the group with crowding, while the edge-like bite and normal overjet in the group without crowding. The findings of the bigger overjet are the least frequent and equally represented in both groups.

Smaller differences in the frequency of certain forms of the overjet between the groups of our examinees do not indicate an interdependence of the examined parameter and the later developed spatial conditions in permanent dentition. The bigger chance to avoid crowding is present in overjet position of the edge-like bite and the normal overjet. Transverse interrelation in the integral sample has been registered only in 5.26% of the examinees, while a slightly greater frequency in the group with later crowding does not stand in favor of the correlation of these two phenomena.

As it was stated before (25), carious or extracted primary teeth favored the development of crowding in permanent dentition.

Conclusion

The established hypothesis regarding the existence of early symptoms relevant to the emergence of crowding of permanent teeth has received only partial confirmation in the conducted survey. From the findings analyzed it follows that the appearance of crowding is in the relation with:

- the lack of physiological diastemas;
- the absence or early closure of the primatical diastema;
- the early loss of equidistal plane;
- caries or extraction of primary teeth.

A more favorable prognosis in preventing the appearance of crowding can be assigned to bigger physiological diastemas, the persistence of equidistal planes, the presence of primatical diastemas and intact primary teeth.

ANALIZA RAZVOJA I OKLUZALNE KARAKTERISTIKE U PRIMARNOJ DENTICIJI KOD ISPITANIKA SA I BEZ ZBIJENOSTI TRAJNIH ZUBI

Sažetak

Činjenica da se kompresija u većem broju slučajeva prvi put pojavljuje za vrijeme mjene zubi, ne isključuje mogućnost ranije pojave određenih indikatora, na temelju kojih bi se mogla predvidjeti buduća anomalija.

S ciljem provjere navedene hipoteze odlučili smo odrediti faktore koji bi mogli biti relevantni za razvoj kompresije i to analizom kvalitativnih i kvantitativnih karakteristika mliječne denticije i evaluacijom utjecaja svakog pojedinog obilježja na prostorne uvjete u trajnoj denticiji.

Uzorak se sastojao od 76 ispitanika oba spola koji su longitudinalno praćeni kroz osam godina. Svakom ispitaniku vrednovane su slijedeće karakteristike: postojanje primatnih dijastema u donjoj čeljusti, stupanj abrazije, postojanje i stupanj fizioloških dijastema u gornjoj čeljusti, stanje ekvidistalne ravnine, sagitalni odnos određen na očnjacima, dubina prijeklopa, transverzalni odnos i incizalna stepenica.

Nakon osam godina ispitanici su podijeljeni u grupe sa (51) i bez kompresije (25), provedena je gnatometrijska analiza, a dobi-

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veni rezultati obrađeni su SAS programskom podrškom za svaku grupu posebno te međusobno uspoređeni.

Hipoteza o postojanju ranih simptoma koji bi bili važni za nastanak kompresije u trajnoj denticiji samo je djelomično potvrđena ovom studijom. Analizom rezultata slijedi da je pojava kompresije povezana s nepostojanjem fizioloških dijastema, odsutnošću ranog zatvaranja primatnih dijastema, ranim gubitkom ekvidistalne ravnine, te karijesom i ekstrakcijom mliječnih zubi.

Bolja prognoza može se očekivati ako su prisutne veće fiziološke dijasteme, ako perzistira ekvidistalna ravnina, ako postoje primatne dijasteme i ako su mliječni zubi intaktni.

Ključne riječi: *razvoj, okluzalne karakteristike, primarna denticija, trajni zub*

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