

Chronology, Dynamics and Period of Permanent Tooth Eruption in Zagreb Children (Part II)

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ABSTRACT

The aim of the present paper is to determine the beginning, order, median time, termination, dynamics, continuity and intensity of the permanent tooth eruption, as well as its calendar, in a sample of Zagreb children. The study included 2768 children (1398 boys and 1370 girls). All subjects were classified in one-year age groups. The continuity of tooth eruption occurs from 5.1 years to 14.97 years, i.e., for a period of 9.87 years. Each particular tooth has its own dynamics of eruption (V_5 – V_{95}) which on the average amounts to 4.25 years. The continuity of eruption is 10.1 years in boys and 9.8 years in girls. The dynamics of eruption is 4.15 years in boys and 4.35 years in girls. A certain asymmetry in eruption has been described.

Introduction

Tooth eruption is an essential process for the survival of many different species and although the movement of teeth into function has been the subject of extensive research there is no consensus as to the mechanism involved¹. Tooth eruption is a physiological phenomenon determined as a rule by the same laws that govern the whole phylogenetic and ontogenetic development of all living beings. It is a part of a physiological whole, so that the factors

affecting the organism as a whole are reflected also on the growth and eruption of teeth. Although this process is genetically determined it is subject to the effects of a series of important factors that cause chronological variations². The timing of tooth eruption depends on a number of factors such as: heredity, constitution, stage of foetal development, foetal position, hormones, race, potential anomalies, climate, nutrition, various diseases, local factors, and so on³. Modern civilisation and urbanisation have affected the

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rate of physical and mental development, and by this the process of tooth eruption also⁴. In humans, the teeth after their full emergence, exhibit a continuous eruption, accompanying the growth in height of the alveolar processes until the termination of facial growth, and probably, at a much reduced rate, for a considerable period thereafter⁵.

The present investigation is aimed at determining, in a group of Zagreb children, the beginning, order, median time, termination, dynamics, continuity and intensity of permanent tooth eruption as well as its calendar.

Subjects and Methods

The study included the children from five pre-school day-care centres and six elementary schools in the city of Zagreb. A total of 2768 children were examined, out of which 1398 (50.5%) were boys and

1370 (49.5%) girls (Tables 1 and 2, Figure 1). The subjects were divided into one-year age classes. The oral cavity examination was carried out by using a standard mirror and a probe. The concentric light was provided by an electric lamp set at a distance of 20 cm from the subject's head. All existing teeth were recorded, regardless of their potential pathological changes. The initial eruption was determined by the time at which 50% of children have a particular tooth in the oral cavity, while the termination of eruption was determined by the fact that 95% of the children have the tooth in question in the oral cavity. In this way, we excluded from the study the rare children with an extremely early or late eruption. Percentage was used as a mathematical-statistical method, while all calculations were made with decimals which denote the tenth parts of a year and not months. The third molar is not presented in this research

TABLE 1
THE DYNAMICS OF PERMANENT TOOTH ERUPTION IN BOYS

Dynamics of eruption – boys (time in years)				
Tooth	V5%	V50%	V95%	V95%–V5%
+1+	6.02	7.50	9.34	3.32
+2+	6.93	8.54	10.52	3.59
+3+	9.78	11.65	13.88	4.10
+4+	8.07	10.33	13.24	5.17
+5+	8.46	10.76	13.68	5.22
+6+	5.23	6.83	8.92	3.69
+7+	10.57	12.62	15.06	4.49
Average period of eruption = 4.23				
-1-	5.25	6.62	8.35	3.10
-2-	6.22	7.66	9.42	3.20
-3-	9.28	10.95	12.93	3.65
-4-	8.35	10.61	13.49	5.14
-5-	8.53	10.90	13.93	5.40
-6-	5.04	6.60	8.65	3.61
-7-	9.91	11.91	14.38	4.47
Average period of eruption = 4.08				
Average period of eruption = 4.15				

TABLE 2
THE DYNAMICS OF PERMANENT TOOTH ERUPTION IN GIRLS

Dynamics of eruption – girls (time in years)				
Tooth	V5%	V50%	V95%	V95%–V5%
+1+	5.69	7.19	9.14	3.45
+2+	6.73	8.30	10.24	3.51
+3+	9.15	11.09	13.44	4.29
+4+	7.72	10.15	13.36	5.64
+5+	8.26	10.70	13.85	5.59
+6+	5.18	6.86	9.07	3.89
+7+	10.38	12.42	14.87	4.49
Average period of eruption = 4.41				
-1-	5.65	7.19	9.14	3.49
-2-	5.77	7.24	9.10	3.33
-3-	8.22	10.03	12.24	4.02
-4-	8.25	10.37	13.04	4.79
-5-	8.44	10.88	14.03	5.59
-6-	5.10	6.98	9.30	4.20
-7-	9.69	11.79	14.36	4.67
Average period of eruption = 4.30				
Average period of eruption = 4.35				

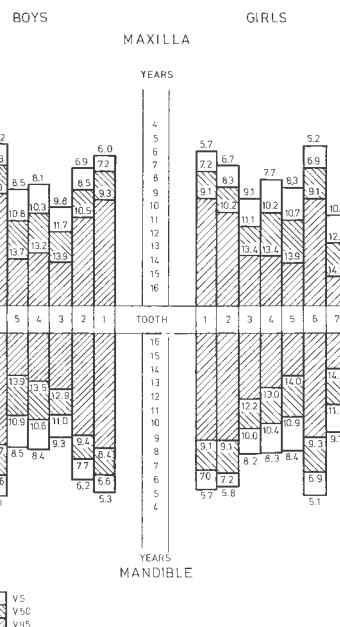


Fig. 1. The calendar of tooth eruption.

because of its great variability and rare presence in the examined group of children.

Results

The first permanent tooth, the first molar, emerges in the mandible at the age of 5.04 years in boys and 5.10 in girls. The first lower molar and the lower central incisor begin to emerge earlier in boys than in girls as a contrast to all other teeth. The fifth and the sixth years of life represent the first period of intensive tooth eruption. The intensity decreases during the seventh year of life only to be increased again during the eighth and ninth year of life. At the age of ten, other molars begin to erupt by which the formation of the dental series ends. As already mentioned, the median time was determined by the fact that a tooth erupted in 50% of the children. The shortest median time is reached by the lower lateral incisor in girls, as it takes only a year for it to erupt in 50% of subjects. The longest median time is found for the upper lower premolar in girls and it amounts to 2.4 years. The times for all other teeth range within this interval, without any significant differences between boys and girls. The time at which a particular tooth is found in 95% of the children was taken as the termination of eruption. The lower central incisor is the first to terminate its eruption at the age of 8.35 years in boys and it is followed by the upper first molar at the age of 8.92 years also in boys. Among other teeth, the eruption of the upper and the second lower premolars, as well as of the first molar terminates earlier in boys than in girls, while all other teeth erupt earlier in girls than in boys. The term dynamics or period of eruption refers to the time needed for each particular tooth to erupt completely. On the average, this period is 4.25 years for all the teeth in boys and girls, while for the mandible it amounts

to 4.19 years and for the maxilla it is 4.32 years. The total average time is 4.15 years in boys and 4.35 years in girls. The difference between the maxilla and the mandible is also small. For the maxilla, the time is 4.23 years in boys and 4.30 years in girls. The shortest time, 3.10 years, is found for the lower central incisor in boys, while the longest time, 5.59 years, is found for the second maxillary and mandibular premolars in girls. Other values are within the range between these two extremes. The process of tooth eruption continues since the age of 5.04 years, when the first lower molar begins to erupt in boys, until the age of 15.06 years, when the eruption of the second upper molars terminates. During this period one or more teeth are constantly in the state of eruption. In girls, the continuity of eruption lasts from the age of 5.10 years, when as in boys the eruption of the first lower molar begins, to the age of 14.87 years, when the eruption of the upper second molar ends. Considering the beginning of eruption, it can be seen that the tooth eruption in boys begins at the age of five years (5.04), when during a very short six-month interval three teeth begin to emerge (the upper central incisor, the lower and the upper lateral incisor). At the age of seven years the process of eruption is interrupted for one year, while at the age of eight four teeth emerge (all four premolars). After that, during the second half of the ninth year both canines as well as the lower second molar emerge. At the age of ten years, the second upper molar begins to erupt. The beginning of eruption is practically continuous, with a short interruption at the age of seven, and it lasts for 5.53 years. It takes 10.02 year from the emergence of the first tooth to the formation of the permanent dentition. In girls, the tooth eruption is also a continuous process. At the age of five years, the first lower and upper molars, the lower and upper cen-

tral incisor and the lower lateral incisor begin to emerge. At the age of six years, only the upper lateral incisor erupts. During the seventh year of life only the upper first premolar emerges, while in the eighth year four teeth (the upper and lower second premolars, the lower first premolar and the lower canine) erupt. During the ninth year of life, the upper canine and the lower second molar emerge. During the tenth year, only the second molar begins to erupt. The continuity of the beginning of eruption lasts in girls from 5.10 years to 10.38 years, i.e., for a period of 5.28 years. During the permanent tooth eruption we can distinguish two periods: the period of an accelerated eruption during which a particular tooth emerges in 50% of the children, and the second, longer period which amounts to 50 and 70% of the total eruption time, when this tooth should emerge in all the children. The most intense eruption is that of the first molar, especially in its first phase. In boys, the lower central incisor has the shortest period of eruption of only 3.10 years. The longest period of eruption, i.e., 5.40 years is required for the second lower premolar. In girls, the lower lateral incisor has the most intense eruption (3.30 years), while the second upper and lower premolars have the longest eruption period (5.59 years).

Discussion

Unglauber and Lipman⁶ reported considerably earlier initial average eruption times, even for the beginning of eruption (V_5) of all teeth. The initial times given by Logan-Kronfeld³ are within the range of the median times found by us for all children. However, as Logan-Kronfeld³ gives approximate average times, the eruption interval in our sample is much longer. Marković⁸ reports average eruption times similar to our median times for both sexes. The average eruption times given

by Radica and Rak⁹ for both boys and girls are much earlier than median times found in the present study. For girls, their average times precede those from the present study for 0.1 to 0.5 months. Harndt¹⁰ also reports earlier average eruption times, except for the times of eruption of the first maxillary premolar and molar, and both mandibular premolars, which are later than those found by our study. The data given by Ležović¹¹ show somewhat earlier initial average eruption times for both boys and girls in comparison to our data, while the times of eruption termination are identical. The initial eruption times in boys shown by Poncova¹² are almost identical to those reported by us. The termination of eruption comes later in the children from our sample, which also have a longer eruption interval. The median time for boys is somewhat later than that reported by the above author for 0.2 to 0.6 years. The beginning of eruption in girls is slightly earlier for all the teeth except for the central and lateral maxillary incisors, and the maxillary and mandibular canines and the first molars. Although the initial eruption time is earlier for these children, the termination time for all teeth is considerably later in the Zagreb girls, while the eruption interval is much longer. The median time reported by Poncova¹² is much earlier than that found by us for all teeth. Seichter¹³ reports average eruption times for the maxilla in boys similar to our data. There is slight difference for the canines, the first and the second premolars in the mandible. In girls, the eruption times for the maxilla are somewhat earlier, except for the canines and both premolars, while the data for the mandible show slightly earlier times for our sample with the exception of the central incisor. Hadžiomaragić¹⁴ mentions that generally the mandible has earlier eruption times because its dentition occurs earlier in 65% of cases. The

eruption of the mandibular central incisors occurs earlier in 88% of cases, that of lateral incisors is earlier in 80%, of canines in 78%, of the first premolars in 36%, of the second premolars in 45%, of the first molars in 66%, and of the other teeth in 68% of cases. There is also a symmetry reflecting the symmetry of the whole body, i.e., the eruption on the left side occurs earlier than on the right side in 4% of cases. The lateral incisor and the canine are an exception to this as they erupt earlier on the right side. In girls, the eruption is earlier for about 8%, while the greatest difference was observed for the molars. Virtanen¹⁵ reports that the differences in age at eruption between the contralateral teeth were either small

or non-existent, but the teeth in the mandible erupted earlier than their homologues in the maxilla. All the teeth emerged earlier in the girls, the difference ranging from 0.1 to 1.0 years depending on the tooth. The emergence of the second phase of the mixed dentition (canines, premolars and second molars) was statistically later for the children with endemic fluoride in their drinking water than for the other groups, this difference being greater among the boys than among the girls. In Pakhalas et al.¹⁶ survey the time required for a tooth to erupt in occlusion varied from 2.6 years (for the first maxillary and mandibular molars in boys) to 5.5 years (for the mandibular canines in boys).

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REDOSLIJED, DINAMIKA I RAZDOBLJE NICANJA TRAJNIH ZUBI KOD ZAGREBAČKE DJECE (DRUGI DIO)

S A Ž E T A K

Cilj rada je bio da se u segmentu populacije zagrebačke djece odredi početak, redoslijed, mijljano vrijeme, završetak, dinamika, kontinuiranost i intenzivnost nicanja trajnih zubi, te kalendar nicanja. Ispitivanjem je bilo obuhvaćeno 2768 djece i to 1398 dječaka i 1370 djevojčica. Svi ispitanici svrstani su u starosne razrede s rasponom od jedne godine. Kontinuiranost nicanja zubi je od 5.1 godine pa do 14.97 godina tj. u razdoblju od 9.87 godina. Svaki pojedini Zub ima i svoju dinamiku nicanja (V_5 - V_{95}) koja prosječno iznosi 4.25 godina. Kontinuitet nicanja za dječake iznosi 10.1 godinu, a za djevojčice 9.8 godina. Dinamika nicanja za dječake iznosi 4.15, a za djevojčice 4.35 godina. Uočena je izvjesna nesimetričnost u nicanju.