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Original Article

Longitudinal Investigation of Relationship between Developmental Changes in Sagittal Occlusion and Caries in Lower First Permanent Molars

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Abstract

The aim of the present study was to investigate the relationship between developmental changes in sagittal occlusion and the presence of caries on the occlusal surface of the lower first permanent molars. Dental casts were taken from 60 children at 2-monthly dental examinations after the emergence of the lower first molars through to when they reached 22 years of age. Data on the state of the occlusal surfaces of 120 lower first permanent molars were collected from these examinations and each occlusal surface classified into one of the following two categories: (1) sound, or (2) caries (filled). Sagittal occlusion of the first permanent molars was classified as Angle Class I, II, or III at each developmental stage. The data were analyzed to assess the relationship between changes in the occlusal characteristics and the presence of caries (fillings) in the lower first permanent molars. Of a total of 120 lower first permanent molars, 36 (30.0%) were filled by the end of the study period. Occlusal caries attacks occurred most commonly between 24 and 72 months after emergence of first permanent molars. New occlusal caries continued to occur thereafter, however, even though the teeth had already erupted for as long as 14 and 16 years. A Class II occlusal relationships in the lower permanent molars throughout the study period showed a significantly stronger correlation with caries than when it changed from Class II to Class I. With a Class II occlusal relationship, the percentage of teeth with fillings showed a continual increase, even though those teeth had already been erupted for between 10 and 16 years by the end of the study. These results suggest that occlusal sealing is still indicated for 3 or more years after eruption when the lower first permanent molars occlude in a Class II relationship as their risk for caries remains relatively high.

Key words: Longitudinal study—Dental caries—Lower first permanent molar—Sagittal occlusion

Introduction

The great strides that have been made over the last decade in reducing caries in children indicate that its complete eradication is now a realistic goal. Indeed, a reduction had been observed in the overall prevalence of caries in most industrialized countries since the

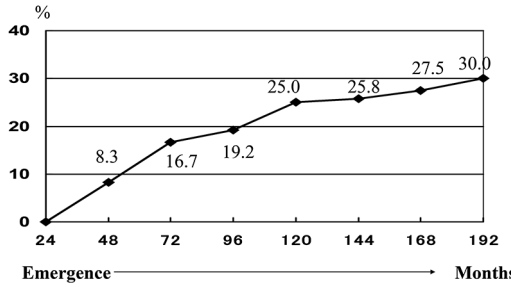

Fig. 1 Percent of caries in first molars after their emergence

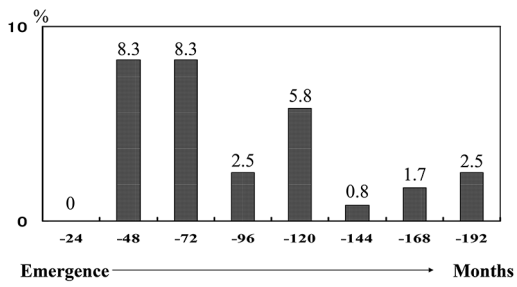

Fig. 2 Caries attack rates after emergence of first molars

1970s. Recent studies[3,6], however, have noted an increases in its prevalence in some countries. In addition, the majority of the caries found in children today occurs in the pits and fissures of the occlusal surfaces of the teeth[1,8], and in the first molars, in particular. Therefore, identifying risk factors for the development of dental caries in the first permanent molar is important in reducing the incidence of caries in children.

In this study, we reviewed data on the state of the occlusal surfaces of the lower first permanent molar teeth from their emergence to up to 16 years later with the aim of assessing whether changes in their sagittal occlusal relationships could be used to predict the development of caries.

Materials and Methods

The data used in the present study were obtained from a longitudinal growth and development study conducted by the Department of Pediatric Dentistry at Tokyo Dental College, which recruited a cohort from 3-year-old children, commencing in 1971. The records of a total of 60 children (27 boys, 33 girls) were reviewed. Each child underwent a series of dental examinations at which dental casts of the lower first molars were obtained at 2-month intervals, commencing shortly after their emergence of lower first molars until the child was 22 years of age.

Each oral health record included information on dental check-ups, oral health status, and caries treatment provided. No children in the study received application of pit and fissure sealant to prevent dental caries.

Data were collected on the state of the occlusal surfaces of 120 lower first permanent molars, with each occlusal surface being classified into one of the following two categories: (1) sound, or (2) caries (filled).

Full-arch maxillary and mandibular impressions were obtained for every child at 2-month intervals. The impressions were poured in yellow stone and the casts were standardized in centric occlusion. This longitudinal series of dental casts was used to describe developments in sagittal occlusion. Sagittal occlusion of the first permanent molars was classified as Angle Class I, II, or III at each developmental stage.

The data were analyzed using the Chi-square and Fisher's exact test with Bonferroni correction for multiple comparisons to assess possible associations between sagittal occlusion and caries status in the first permanent molars.

Results

1. Longitudinal study of caries susceptibility in lower first permanent molars

Of a total of 120 lower first permanent molars, 36 (30.0%) were filled by the end of the study. Occlusal caries attacks had been most prevalent between 24–48 months and

Table 1 Characteristics of molar occlusion and prevalence of caries

Characteristics	N	%	Caries prevalence (%) N	%	
Initial occlusal relationship					
Class I	43	35.8	17	39.5	
Class II	75	62.5	19	25.3	
Class III	2	1.7		0	
Final occlusal relationship					
Class I	80	66.7	18	22.5	*
Class II	16	13.3	9	56.2	p value: 0.006
Class III	24	20.0	9	37.5	
Developmental changes of occlusion					
Class I → Class I	25	20.8	9	36.0	
Class I → Class III	18	8.3	8	44.4	
Class II → Class I	53	44.2	9	17.0	*
Class II → Class II	16	13.3	9	56.2	p value: 0.001
Class II → Class III	6	5.0	1	16.7	
Class III → Class I	2	1.7		0	

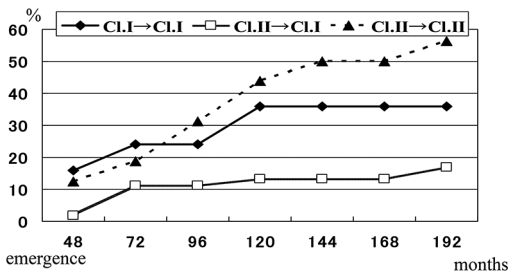

Fig. 3 Percent of caries in first molars after their emergence by type of sagittal relationship (Angle classification), from initial to final evaluations

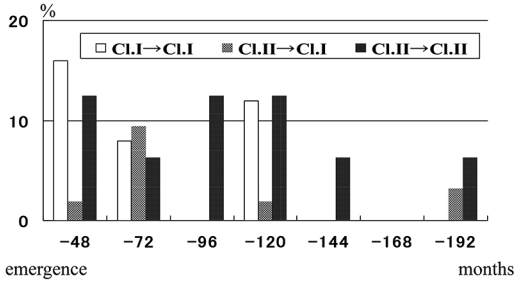

Fig. 4 Caries attack rates after emergence of first molars by type of sagittal relationship (Angle classification), from initial to final evaluations

49–72 months after the emergence of the first permanent molars. New outbreaks of occlusal caries continued to occur thereafter, however, even though the teeth had already been erupted for between 14 and 16 years (Figs. 1, 2).

2. Relationship between type of sagittal occlusion and dental caries in lower first permanent molars

A Class II occlusal relationship in the lower permanent molars throughout the study period showed a significantly stronger correlation with the development of caries than when it changed from Class II to Class I (Table 1).

Where the occlusal relationship was Class II, the percentage of teeth with fillings increased throughout the study, even though the teeth had already been erupted for between 10 and 16 years by the end of the study period (Figs. 3, 4).

Discussion

The notion that the peak occlusal caries rate occurs soon after eruption was derived from reports published in the 1950s and 1960s[2,7]. In the mid-1970s, Eden found that the occlusal caries rates in molars of adolescent and young adults (17- to 23-year-old) was only 4 percent[4]. He concluded that the period of highest susceptibility to caries in the occlusal surfaces of the molars had passed, and that sealants therefore, were not indicated in this age group. Consequently, the need for sealant is believed to be low after a few years have passed after eruption.

However, the present study's finding of a relatively constant rate of attack in the occlusal surfaces of the lower first permanent molars for up to 16 years after eruption is inconsistent (Fig. 1) with the prevailing wisdom concerning occlusal caries in the lower permanent molars. The implications of these findings may substantially alter dental treatment philosophy, especially concerning the use of sealant in children. In other words, sealing of the first permanent molars after eruption may also be recommended in cases that seem to be at moderate or high risk of developing dental caries.

Another important finding was a Class II occlusal relationships in the lower first permanent molars throughout the study period showed a significantly stronger correlation with the development of caries than when it changed from Class II to Class I (Fig. 2). Ekstrand *et al.*[5] investigated the influence of sagittal occlusion on occlusal plaque formation in the permanent first molars and reported that the mandibular occlusal surfaces in Class I occlusion had significantly less plaque accumulation than teeth with 1/4, 1/2, or 3/4 cusp distal occlusion. The results of the present study thus support the motion that incomplete occlusal interdigitation plays a significant role in plaque accumulation, which is also related to occlusal caries activity.

Occlusal sealing at 3 or more years after eruption is indicated when the lower first permanent molars show a Class II occlusal relationship, as the risk of caries will therefore remain relatively high for up to 10 or more years after eruption.

The present promising results warrant further research and consideration as indication an easily identifiable risk factor for caries in children. To develop better tools for assessing the risk of caries, research on the morphology of the pits and fissures of the first permanent molars and its relationship with the development of caries is now in progress.

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