The Prevalence of Deciduous Tooth Wear In Six-year-old Children and its Relationship with Potential Explanatory Factors

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Purpose: To evaluate the prevalence and aetiological factors involved with wear of deciduous teeth.

Materials and Methods: A convenience sample of 356 children (aged 6 years old) was selected at Bauru, SP (Brazil). Clinical examinations were carried out by 1 examiner (Kappa = 0.87), using the Tooth Wear Index (G0–G4). A questionnaire addressing the aetiological factors of tooth wear was applied to parents.

Results: Wear on the incisors was diagnosed in 34.8% of children (91.1% G1 and 6.4% G2); 78.1% presented wear in canines (64.7% G1 and 33.1% G2); and 40.7% in molars (89.6% G1 and 9.0% G2). No significant correlation was observed between gastro-oesophageal reflux, toothbrushing habits, or consumption of citrus fruits/soft drinks and the presence of tooth wear for all groups of teeth. The wear showed correlation with the presence of bruxism for canines and with the habit of holding drinks in the mouth before swallowing for incisors (Chi-square test, p<0.05).

Conclusions: The findings indicate that the wear of incisors could be considered physiological for this age. Further longitudinal studies should be conducted in order to measure the wear in canines and molars in the period close to their replacement by permanent teeth.

Key words: deciduous, tooth abrasion, tooth attrition, tooth erosion

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Tel: 00-55-14-32358246, Fax: 00-55-14-32241388. Email: mbuzalaf@fob.usp.br n recent decades, the reduction in caries prevalence in children from most developed countries (Peterson and Bratthall, 1996), as well as in Brazil (Souza, 1996), led to an increasing interest in other dental disorders, including tooth wear (Imfeld, 1996; Peres et al, 2005). The term tooth wear is used to describe the processes of erosion, attrition and abrasion (Eccles, 1982; Litonjua et al, 2003).

Dental erosion is defined as the loss of tooth substance by chemical processes not involving bacteria (Imfeld, 1996; Moss, 1998). The aetiology of erosion is multifactorial and not fully understood. The most important sources of acids are those found in diet (acidic foods and drinks) (Lussi et al, 2004) and from the stomach (gastric acids from regurgitation and reflux disorders) (Scheutzel, 1996; O'Sullivan et al, 1998).

Dental attrition is the tooth wear resulting from tooth-to-tooth contact (Litonjua, 2003), and dental

abrasion is the pathological wear of teeth as a result of abnormal processes, habits, or abrasive substances (Bartlett and Smith, 2000; Litonjua, 2003). The main aetiological factor of attrition is bruxism, which is the contact of teeth for reasons other than eating (Bartlett and Smith, 2000), while toothbrushing is the main cause of dental abrasion (Kuroiwa et al, 1994; Addy and Hunter, 2003).

These processes can occur individually or together, although the effect of erosion is often dominant according to many studies (Millward et al, 1994b; O'Brien, 1994; Hinds and Gregory, 1995; Jones and Nunn, 1995; Walker et al, 2000). It is almost impossible to distinguish between the influence of erosion, attrition or abrasion during clinical examination without introducing bias into the assessment procedure (Bartlett, 2005). Accepting that these processes are not seen in isolation, history and clinical appearance can lead to identification of the predominant aetiological factor of tooth wear.

Thus, the objective of the present study was to assess the prevalence and severity of tooth wear in deciduous teeth of 6-year-old children and its relationship with potential explanatory factors, such as dietary habits, gastric problems, oral hygiene behaviour and the presence of bruxism.

MATERIALS AND METHODS

An obervational, cross-sectional study was conducted at Bauru Dental School, University of São Paulo, after approval by the Institutional Review Board of the University. A convenience sample of 356 6-year-old children, from all areas of the city, was selected among the patients attending the Pediatric Dentistry Clinic of Bauru Dental School. Informed consent was obtained from the parents before participation in the study.

A self-administered questionnaire was filled out by the parents, which was then revised by an assistant and discrepancies were clarified (Mathew et al, 2002). Thirty-three questions were related to diet, hygiene habits, parafunctional habits and history of gastrooesophageal reflux in the children. The type of toothbrush, frequency and technique of toothbrushing, as well as the schedule of oral hygiene (immediately after meals or not) were reported. With regard to gastrooesophageal reflux, the parents were asked about the presence of this health problem and the period of its occurrence. The frequency and period of intake of fruits, soft drinks and fruit juices were assessed. In respect to parafunctional habits, it was asked if the child presented bruxism (attrition).



Although the questionnaire was self-administered, the parents were partially interviewed to clarify doubts, especially regarding bruxism, symptoms of gastric disorders and the habit of holding the drink in the palatal vault before swallowing. The parents were also asked to report data only if they were sure about the answer. A lot of mothers had never observed if their children swallowed or held the liquids in the mouth before swallowing. These mothers were asked not to answer this question.

A dental assistant brushed the children's teeth prior to clinical examination, which was performed by a single examiner. An intra-examiner test was conducted by re-examining 40 subjects. In this case, the examiner was blinded to the previous tooth wear score. Intra-examiner reproducibility data yielded a weighted kappa statistic value of 0.87, which indicates a high level of agreement. The clinical examiner was blinded to the results of the questionnaire at the time of dental examination.

For examination, the teeth were thoroughly dried. All deciduous teeth and their surfaces (buccal, occlusal/incisal and lingual) were examined for tooth wear, except for those with caries or fillings, under standard illumination from a dental light. Permanent teeth were not assessed. Tooth wear was graded using the Tooth Wear Index (Smith and Knight, 1984): GO, no loss of enamel surface; G1, superficial loss of enamel surface; G2, loss of enamel exposing dentine on less than 1/3 of the surface; G3, loss of enamel exposing dentine on more than 1/3 of the surface; G4, complete loss of enamel with pulp exposure or exposure of secondary dentine. In case of doubt, the lower index was considered. The mean wear score was computed for the groups of incisors, canines and molars, by calculating the sum of scores of all available tooth surfaces divided by the total number of surfaces.

Statistical analysis of data collected with the questionnaire and clinical examination was performed using Statistic for Windows version 5.1 software. Descriptive and analytical approaches were used for analysis of data. Tests of the association between wear and risk factors were carried out using the Chi-square Test. Statistical significance was established at the 5% level.

RESULTS

A sample of 356 children participated in the study. At examination, 124 (34.8%: 91.1% G1, 6.4% G2 and 2.4% G3) showed evidence of wear on incisors, 278 (78.15%: 64.7% G1, 33.1% G2 and 2.2% G3) on ca-



 Table 1 Percentage of severity of Tooth Wear Index (Smith and Knight, 1984)

 presented by children according to the type of teeth

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Teeth	G0 % (n)	G1 % (n)	G2 % (n)	G3 % (n)	G4 % (n)
Incisors	65.2% (232)	31.8% (113)	2.2% (8)	0.8% (3)	0% (0)
Canines	21.9% (78)	50.6% (180)	25.8% (92)	1.7%(6)	0% (0)
Molars	59.3% (211)	36.5% (130)	3.6% (13)	0.6% (2)	0% (0)

Table 2 Association between the habit of holding drinks before swallowing and incisors tooth wear

Risk Factor	Inci	Incisors		
	Wear % (n)*	No wear % (n)*		
Swallow	60.55% (52) 77.22% (58)	39.45% (34)		
p and χ^2	p=0.021	$\chi^2 = 5.266$		

* n<356, because parents who were not sure about the answer were excluded to reduce bias

Table 3 Association between the presence of bruxism and canine tooth wear					
Bruxism	Canines				
	Wear % (n)*	No wear % (n)*			
Yes	95% (57)	5% (3)			
No	82.5% (184)	17.5% (39)			
Sometimes	75% (27)	25% (9)			
p and χ^2	p=0.018	χ ² =7.944			
* n<356, because parents who were not sure about the answer were excluded to reduce bias					

nines and 145 (40.7%: 89.6% G1, 9.0% G2 and 1.4% G3) on molars. More wear was observed on canines.

The Tooth Wear Index results are shown in Table 1. Not considering GO, for the incisors and molars, the most prevalent index was G1 (31.8% and 36.5% respectively). However, for the canines G1 was present in 50.6% of children and G2 in 25.8%. No children in this study sample presented with G4.

Correlation analysis (Chi-square test, p<0.05) revealed no relationship between stomach problems, frequency of fruit intake, frequency of soft drink intake, toothbrushing immediately after meals, presence of bruxism and tooth wear on incisors and/or molars.

The habit of holding the drink in the palatal vault before swallowing was significantly correlated with the presence of tooth wear in incisors (Table 2). Table 3 shows that tooth wear in canines was more prevalent in children with bruxism (Chi-square test, p<0.05).

DISCUSSION

There has been considerable interest in the prevalence of tooth wear in children. In contrast to dental caries, age is considered in the judgement of whether a given wear lesion is pathological or not (Ganss et al, 2001). However, few studies mention if the tooth wear is physiological or pathological, especially in deciduous teeth. Smith and Robb (1996) estimated that up to 97% of the adult population is affected by tooth wear, with about 7% exhibiting pathological degrees of wear that may require treatment.

The children involved in this study were 6 years old, because at this age they present all deciduous teeth and the deciduous incisors are almost being replaced by their permanent successors. Therefore, the incisors had been exposed to aetiological factors for tooth wear in the oral environment for approximately 5 years, which is an ideal period to judge if wear on deciduous incisors is pathological or not.

The prevalence of tooth wear was divided into three different groups of teeth for assessment of the aetiological factors involved and types of teeth most susceptible to tooth wear. The tooth wear on incisors was present in 34.8% of children and severity was very low, since the major index obtained was G1 (91.1%), superficial loss of enamel surface, characterised by smooth and shiny appearance of enamel (Amaechi and Higham, 2005). Taking into account that the children were 6 years old, the wear on incisors could be considered physiological, since there were no aesthetic, symptomatic or functional alterations (Imfeld, 1996; Bartlett and Smith, 2000; Litonjua et al, 2003). Furthermore, at this age these teeth could be considered 'old' as they would soon be replaced by their permanent successors.

The molars presented more wear (40.7%) and also their superficial loss of enamel was more prevalent (89.6%). Similar results were obtained by Ganss et al (2001) in a cross-sectional study for a period of 5 years using orthodontic casts. These authors found tooth wear in the deciduous molars in 44% of the sample, and more severe wear was present in 11% of dental casts.

Millward et al (1994a) evaluated the distribution and severity of tooth wear in a group of children using the Tooth Wear Index. The tooth wear data related to incisal edges of anterior teeth, including canines, was excluded. The authors excluded the influence of attrition on tooth wear for achievement of meaningful information on tooth tissue loss from erosion. However, the present study intended to evaluate the multifactorial character of tooth wear, with special attention not only to erosion, but also to attrition and abrasion.

The results showed that the canines had the most prevalent wear (78.1%) and the most severe index (33.1% of G2), mainly on the incisal edges. The presence of bruxism showed a statistically significant correlation with wear only for the canines (Table 3), suggesting that attrition could be the main cause of wear on the incisal edges of canines. Further longitudinal studies should be conducted to measure the wear on canines and molars at the period close to their replacement by the permanent successors, to judge if it is pathological or not.

Although it is difficult to compare accurately the results of this study with other prevalence studies in deciduous teeth owing to the different indices used, study criteria, diagnostic criteria, age of children and tooth surfaces examined, it appears that the prevalence and severity of wear on deciduous teeth was similar to, or lower than, the rates reported previously (Hinds and Gregory, 1995; Jones and Nunn, 1995). O'Brien (1994) examined the maxillary deciduous incisors of 5-year-old children and obtained a prevalence of 52% of dental erosion, from which 24% had exposed dentin. A worse scenario was shown in the study by Millward et al (1994a), which observed erosion with exposed dentine in 48.3% in all deciduous teeth of 4to 5-year-old children.

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The questionnaire used in the present study covered a number of dietary items, toothbrushing habits and stomach problems, previously reported to be related to tooth wear. One of the limitations of this study could be the information bias. However, two aspects have to be considered. Firstly, there is little popular knowledge about erosion compared with dental caries. Secondly, we excluded the answers when the parents were not sure about the questioned child habit. This could reduce the parents' report bias. Data analysis showed no statistically significant relationship between tooth wear and dietary behaviour. These results are in accordance with the findings of a survey on 1.5to 4.5-year-olds in the United Kingdom and in contrast with others studies (Millward et al, 1994a, 1994b; O' Sullivan and Curzon, 2000; Al-Malik et al, 2001). These authors found a relationship between the frequency of consumption of soft drinks and fruits, and dental erosion.

The act of drinking, and its relevance to erosion, was evaluated to assess if the subjects had any reported habits associated to drinking, such as swishing, sucking or holding drinks in the mouth. The results of the present study found that the prevalence of tooth wear on incisors was significantly higher in children that hold drinks in the mouth before swallowing (Table 2). This result, similar to those reported by O'Sullivan and Curzon (2000), could be explained by the prolonged contact of acid with the anterior teeth in the mouth. Thus, emphasis should be given regarding abstaining from swishing and holding acidic drinks, as well as using narrow bore straws for consumption of acidic drinks, mainly after the eruption of permanent incisors.

The oral hygiene habit of brushing immediately after meals was not related with the prevalence of tooth wear in the present sample of children, in accordance with other studies (Millward et al, 1994b; Al-Malik et al, 2001). Although fluoride (in high concentration) and saliva are considered protective factors to dental erosion (Wiegand and Attin, 2003; Rios et al, 2006), they were not investigated in the present study. There is a need for further studies comparing the presence of preventive measures and prevalence of dental wear. Passive regurgitation in gastro-oesophageal reflux disease and also passive regurgitation or chronic vomiting has been associated with acidic dissolution of dental hard tissues. This is due to the consequent repeated direct contact of teeth with gastric contents, whose pH can be as low as 1.0 (Scheutzel, 1996). However, the present study did not find a correlation between stomach problems and tooth wear. Few aetiological factors investigated were related with wear in the present study. Therefore other host factors should be considered in future studies, such as the quantity and quality of saliva or the composition of enamel and dentine.

The assessment of wear on deciduous teeth and its relationship with aetiological factors should be regarded as a powerful tool to predict the wear on permanent teeth (Ganss et al, 2001), providing early information about wear and allowing the establishment of prophylactic measures.

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