Original Article

Tooth Wear in the Mixed Dentition: A Comparative Study between Children Born in the 1950s and the 1990s

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Abstract: The aim of this study was to evaluate the degree of tooth wear in posterior deciduous teeth of 100 subjects in the second phase of mixed dentition who were born in the 1950s (50sG) and 100 subjects born in the 1990s (90sG). The degree of abrasion for each posterior deciduous tooth was scored ranging from 0 to 3. The comparison of the degree of abrasion showed significant differences between the two groups for all examined teeth (upper and lower deciduous canines and first and second primary molars) all of which appeared to be more abraded in the 50sG. The findings of the present study indicate that subjects who were born in the 1950s exhibited a significantly greater degree of tooth wear on the posterior deciduous teeth when compared with contemporary subjects, along with a well-recognized lower prevalence of malocclusions. Changes in dietary habits and a diet based on processed foods may be postulated as factors involved with a decrease of dental attrition in contemporary populations. An increase in the prevalence of mouth breathing (tested in the present study) appears to be associated with a decrease in tooth wear in the contemporary population as well. (*Angle Orthod* 2005;75:340–343.)

Key Words: Occlusal wear; Mixed dentition; Malocclusion; Dental attrition

INTRODUCTION

Tooth wear consists in the loss of hard tissues of teeth as a result of different processes. Tooth attrition is that physiological condition[1] represented by a regular and slow progressive loss of dental tissues as a consequence of tooth-to-tooth contact as in mastication.[2,3] Tooth abrasion is a pathological loss of tooth hard substance because of the friction of a foreign body,[4] abnormal processes, habits, or abrasive substances.[3,4] Tooth wear and abrasion must be distinguished from erosion, which is a loss of dental hard tissues caused by chemical agents, without the intervention of bacteria.[2–6]

Tooth wear appears to be reduced in modern populations. Campbell[7] and Campbell and Lewis[8] reported more frequent tooth wear in nomadic Australian Aboriginals as compared with settled and rationed Aboriginals. Corruccini et al[9] obtained similar results comparing modern Yuendumu Australian Aboriginals with older ones and with skulls of ancient Aboriginals. Davies and Pedersen[10] found a higher degree of tooth wear on both the deciduous and permanent teeth of Eskimos living a more traditional way of life in contrast with the more urbanized Eskimos.

Lunt[11] examined Scottish medieval children and reported a high degree of tooth wear with respect to English children living in the 1970s (when the study was carried out). Helm[12] in 1979 obtained similar results in modern Danes when compared with Australian Aboriginals and medieval Danes. He suggested that the lack of dental tooth wear associated with less vigorous masticatory function could be responsible for increased orthodontic problems.[12]

Extensive tooth wear has been reported in North American Indians, Greek mountaineers,[13] Bantu,[14] early Anglo-Saxons,[15] medieval humans,[16] prehistoric Amerindians,[17] and Roman-British[18] as well. All these populations showed well-developed maxillary bones and a very low prevalence of malocclusions. The reduced degree of tooth wear present in modern populations appears to be one of the causes of increased prevalence of malocclusions in industrialized populations. In fact, Lindsten et al[19,20] reported a trend toward an increased prevalence of malocclusions in children born in 1980s when compared with children born in 1960s.

Abrasion on deciduous teeth allows for adequate sliding between the dental arches, which is a necessary condition to achieve a functionally correct development of the mas-

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ticatory system.[12,13,21] The correlation between absence of tooth wear on deciduous teeth and malocclusions has been demonstrated for sagittal disharmonies by Moyers and Wainright[22] and for transverse disharmonies by Tollaro et al.[23]

All the studies concerning dental wear compared populations in which there was a dramatic change in lifestyle and dietary habits, ie, a shift from a ''primitive'' to a ''civilized'' way of life and diet. It is the aim of the present investigation to evaluate the degree of tooth wear in two modern samples living in the same geographic area and separated by almost 35 years: (1) a group of individuals born in 1950s and (2) another group of subjects born in 1990s.

MATERIALS AND METHODS

Subjects

The 1950s group (50sG) of 100 subjects (52 boys and 48 girls) was derived from the files of patients who were first observed at the Department of Orthodontics of the University of Florence, Italy, in the 1960s. All subjects were born between 1953 and 1959. The mean age of the 50sG was seven years and 11 months ± eight months. The 50sG patients presented 43 subjects with Class I, 47 subjects with Class II, and 10 subjects with Class III malocclusions.

The 1990s group (90sG) of 100 subjects (52 boys and 48 girls) was derived from patients observed at the same Department in the years between 1996 and 2003. These subjects were born between 1990 and 1998, and they were affected by Class I (37), Class II (61), and Class III (2) malocclusions. The mean age of the 90sG was eight years and five months ± 13 months.

The following inclusionary criteria were adopted for both groups: (1) availability of detailed clinical files, (2) absence of any previous orthodontic treatment, (3) absence of bruxism, (4) absence of unilateral posterior crossbite, (5) availability of dental casts of good quality, (6) absence of missing teeth, dental traumas, dental anomalies, deep caries, restorations, pedodontic crowns, and (7) availability of panoramic radiographs.

All subjects were Caucasians belonging to the same geographic area (Tuscany). They all presented in the second phase of the mixed dentition (presence of permanent upper and lower central and lateral incisors and first molars). The similarity of two groups as to mean age was desirable because tooth abrasion increases throughout the years in the same subjects.[24] To reduce the range of variables affecting tooth wear, the two groups were matched for sex distribution and prevalence of sagittal malocclusions. Unilateral posterior crossbites (as assessed from the dental records and confirmed by the dental casts) were excluded because of the expected significant differences of tooth wear between the sides with and without crossbite.[23] Panoramic radiographs were examined to control the absence of dental anomalies, deep caries, restorations, and pedodontic crowns.

Methods

Two operators simultaneously examined the dental casts of the two groups in the same room and in the same lighting conditions. They were blinded with regard to which group the dental casts belonged. The degree of abrasion for every posterior tooth was assigned a score variable from 0 to 3, according to the method by Knight et al.[25] The investigators had been calibrated in their expertise with regard to the use of the method as published by Knight et al.[25]

Score 0 = no obvious wear facets in enamel, occlusal/incisal structure intact; score 1 = marked wear facets in enamel, occlusal/incisal structure altered; score 2 = wear into dentin, dentin exposed occlusally/incisally or occlusal/incisal changed in shape (or both); score 3 = extensive wear into dentin, greater than two mm^2 of exposed dentin occlusally/incisally, and occlusal/incisal structure totally lost, locally or generally.

The degree of tooth wear on the upper and lower deciduous canines, the first deciduous molars and the second deciduous molars was calculated because tooth abrasion has a faster evolution on primary teeth,[26] which should present physiologically reduced enamel width.[27] The permanent central and lateral incisors and first molars were not analyzed. The recorded data for the two groups were organized as follows for statistical evaluation: degree of abrasion of single teeth and degree of abrasion of single posterior segments of the dental arch (upper and lower posterior segments, each one consisting of the deciduous canine, the first deciduous molar, and the second deciduous molar).

Reproducibility error

The reproducibility error was tested for the same operators in a recent study.[23] Scores of two different observations were statistically compared using Kappa test with Yates' correction to calculate the degree of reproducibility in judgment. The result (0.94) expressed a high rate of reproducibility.

Statistical analysis

Descriptive statistics comprising prevalence rates for different abrasion scores were calculated. The categorical values for wear ratings were compared using Mann-Whitney *U*-test. All comparisons contrasted the degree of wear for single teeth and for single arch segments.

RESULTS

Descriptive statistics and statistical comparisons for the two examined groups are given in Table 1. The comparison of the degree of abrasion for single teeth showed significant differences between 50sG and 90sG for all examined teeth

TABLE 1. Categorical Values for Tooth Wear Ratings for Single Teeth and Single Posterior Arch Segments

	50sG[a]				90sG[a]				Mann-Whitney *U*-test Significance
Tooth wear score	0	1	2	3	0	1	2	3	
Right C sup	1	9	54	36	2	23	68	7	****
Right D sup	0	19	74	7	4	48	48	0	****
Right E sup	0	50	50	0	14	66	20	0	****
Right upper segment	1	78	178	43	20	137	136	7	****
Left C sup	1	7	56	36	2	24	69	5	****
Left D sup	1	16	81	2	4	40	56	0	****
Left E sup	1	45	54	0	9	73	18	0	****
Left upper segment	3	68	191	38	15	137	143	5	****
Right C inf	0	15	66	19	1	26	69	4	****
Right D inf	0	16	83	1	2	34	64	0	****
Right E inf	0	34	66	0	9	50	41	0	****
Right Lower segment	0	65	215	20	12	110	174	4	****
Left C inf	0	15	64	21	2	23	73	2	***
Left D inf	0	11	88	1	4	33	63	0	***
Left E inf	0	32	68	0	7	50	43	0	****
Left lower segment	0	58	220	22	13	106	179	2	****
Total	4	269	804	123	60	490	632	18	****

[a] 50sG indicates the 1950s group; 90sG, the 1990s group.
*** Significant difference between 50sG and 90sG, $P \leq .001$.
**** Significant difference between 50sG and 90sG, $P \leq .0001$.

(upper and lower canines and first and second deciduous molars), which appeared to be significantly more abraded in 50sG. A significant smaller degree of abrasion in left and right, upper and lower posterior segments of the dental arches was found in 50sG when contrasted with 90sG. The level of significance was $P = .001$ for lower left deciduous canine and first molar and $P < .0001$ for the other comparisons.

The deciduous canines were the most abraded teeth in all groups. Absence of tooth wear (score 0) was observed in only four of 1200 teeth (0.33%) in 50sG, whereas 60 out of 1200 teeth (5%) were considered free of tooth wear in 90sG. Extensive tooth wear (score 3) was assessed in 123 of 1200 teeth (10.25%) in 50sG and in only 18 of 1200 (1.5%) in 90sG.

DISCUSSION

The wear of occlusal surfaces of primary teeth is a physiological condition in the deciduous and mixed dentitions.[13] The lack of dental wear is one of the recognized etiologic factors of malocclusions. Unworn cusps can cause dental interferences leading to forced guidance of mandible in an incorrect position, in the sagittal or transverse plane.[21–23]

Investigations in the past identified a large amount of tooth wear in primitive populations, where the prevalence of malocclusions was lower when compared with contemporary groups.[7–18] Previous studies have shown also an increasing prevalence for certain malocclusions in the past 30 years of the past century.[19–20] The aim in this study was to test whether there has been a significant increase or decrease in the amount of wear of deciduous teeth along the same period because an occlusal aspect possibly correlated to malocclusions.

The findings of the present study indicated that untreated subjects in the mixed dentition born in 1990s show a significantly lesser degree of dental abrasion of posterior deciduous teeth when compared with subjects born in the 1950s. Extensive wear into the dentin (score 3) was observed in only 1.5% of examined teeth in the contemporary sample, a percentage which is similar to the one assessed by Knight et al (2.7%).[25] Subjects who were born in the 1950s showed a larger number of teeth with score 3 (10.25%).

Previous studies[19,20] on the secular trend of malocclusions in recent years advocated that the change in dietary habits that occurred in the past decades appears to be linked to the increased prevalence of occlusal disorders. The decrease in masticatory activity as a consequence of the increased use of processed food could also be responsible of inadequate wear of deciduous teeth along with underdeveloped jaws. Dental interferences and forced guidance of mandible to an incorrect position in both the sagittal or transverse planes result from lack of physiological changes in the dental arches.[22,23] On the contrary, the use of hard and fibrous foods is associated with a greater diameter of the dental arches, with an increased wear of occlusal surfaces,[13] and with a smaller probability of occurrence of anomalous occlusal patterns.

Mouth breathing, as a consequence of the increased prevalence of allergies,[28] has also been reported as a significant

cause for the amplified prevalence of malocclusions in the past years.[19] The analysis of anamnestic and clinical records of the subjects examined in the present study revealed that the prevalence of mouth breathing was only 3% in 50sG, whereas the prevalence was 21% in 90sG, a difference which is statistically significant ($\chi^2 = 15.3$; $P < .001$). According to these results, a higher prevalence of oral respiration appears to be associated with the lower prevalence in tooth wear in the contemporary population.

CONCLUSIONS

The posterior deciduous teeth of children born in the 1990s showed significantly less abrasion in comparison with children born in the 1950s. A significant association between lack of tooth wear and increase of prevalence of oral respiration may play a role in the modification of the physiological abrasion of deciduous teeth.

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