Dental arch dimensions and tooth wear in two samples of children in the 1950s and 1990s

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IN BRIEF
- Increase understanding of the pattern of tooth abrasion and malocclusion in mixed dentition.
- Provides insight into the relationship between contraction of upper arch and dental interferences with malocclusions.
- Discusses the role of environmental factors in the genesis of malocclusions.

Aim The objective of this study was to compare the degree of tooth wear in posterior deciduous teeth and the dental arch dimensions in the mixed dentition in two modern samples living in the same geographic area and separated by almost 35 years. **Methods** Dental casts of a group of subjects born between 1953 and 1959 were compared with subjects born between 1990 and 1998. The evaluation of tooth wear scores and measurements for posterior and anterior arch segments, intermolar and intercanine width, and mesiodistal size of incisors were taken. The available anterior space in both arches and the posterior and anterior transverse dimensions were calculated. Groups were compared using a nonparametric test (Mann-Whitney U-test) for independent samples ($P < 0.05$). **Results** The results show that both boys and girls of the 1990s showed significantly smaller maxillary intermolar width when compared with the 1950s. Posterior transverse interarch discrepancy was significantly minor in girls of the 1990s. The comparison of abrasion showed significant differences between the two groups for all examined teeth which appeared to be more abraded in the 1950s group. **Conclusions** This association can partially explain the greater risk of developing malocclusions in contemporary children compared with children living 35 years before.

INTRODUCTION

Malocclusion includes the malposition of individual teeth, discrepancies between tooth and jaw size and malrelations of the dental arches in the sagittal, transverse, and vertical dimensions.[1]

A high prevalence of malocclusion was reported in many contemporary cohorts while populations living in primitive conditions were often described with good dental alignment and with an almost correct occlusion.[2,3]

These observations were the basis to indicate malocclusion as a 'disease of civilisation'. A dramatic difference is demonstrated in individuals with a similar genetic pool in the change from a socio-technologically preindustrial situation to another influenced by industrialisation.[4] Secular trends in occlusal patterns were reported in several populations between ancient and modern subjects. Differences were reported also in groups of the same century separated by almost 30 years.[5-9]

Modifications of the environment surely have a major role in causing a severe increase in the prevalence of malocclusions.[2,3] Changes in dietary habits[4] and a greater prevalence of respiratory pathologies in the last decades[6] were held responsible for a progressive increase in the prevalence of malocclusions. The decrease in masticatory performance caused by the widespread use of processed food could be responsible for inadequate wear of deciduous teeth along with underdeveloped jaws. Dental interferences, forced guidance of the mandible and an incorrect position in both the sagittal or transverse planes can result in a lack of physiological changes in the dental arches.[10,11]

The aim of this study is to compare the dental arch dimensions and the degree of occlusal tooth wear in the mixed dentition (Fig. 1) of two modern samples living in the same geographic area and separated by almost 35 years: a group of subjects born in the 1950s and another group born in the 1990s, in order to investigate the biological bases of malocclusions.

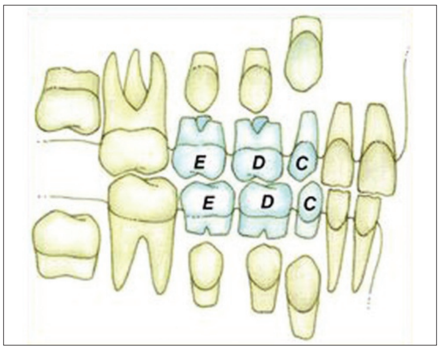

Fig. 1 Mixed dentition at about nine years. At this stage the following dental groups are present: permanent maxillary and mandibular first molars; permanent maxillary and mandibular central and lateral incisors; primary maxillary and mandibular second molars (E), first molars (D) and canine (C)

SUBJECTS

The 1950s group (50sG) with 100 subjects (52 boys and 48 girls) derived from the records 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 exhibited 43 subjects with Class I, 47 with Class II, and 10 with Class III malocclusions.

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The 1990s group (90sG) with 100 subjects (52 boys and 48 girls) derived from patients observed at the same department between 1996 and 2003. These subjects were born between 1990 and 1998, and they presented 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 inclusion criteria were adopted for both groups:

1. Availability of detailed clinical files
2. Availability of good quality dental casts
3. Absence of any previous orthodontic treatment
4. Absence of bruxism
5. Absence of missing teeth, dental traumas, dental anomalies, deep caries, restorations, pedodontic crowns
6. Availability of panoramic radiographs
7. Absence of prolonged sucking habit extending over four years of age
8. No ancestors of foreign origin
9. Absence of any major dentofacial anomaly (cleft lip and palate or others).

Panoramic radiographs were examined to control the absence of dental anomalies, deep caries, restorations and pedodontic crowns.

The sample utilised for the evaluation of the dental arch dimensions in mixed dentition was reduced to 83 subjects (39 boys and 44 girls) from the 1950s and to 84 (38 boys and 46 girls) for the subjects from the 1990s, because the cases without complete eruption of the first molars were excluded.

The mean age of the 50sG was eight years and three months ± 15 months for boys and seven years and 11 months ±12 months for girls.

METHODS

Two of the authors (MA and BG) evaluated the dental casts of the two groups simultaneously in the same room and in the same lighting conditions. They were blinded with regard to which group the dental casts belonged. On the basis of the degree of abrasion a variable score from 0 to 3 was assigned to posterior teeth, according to the method described by Knight *et al.*[12] (Fig. 2).

- 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 dentinee, occlusally/incisally exposed dentinee or occlusal/incisal shape changed in shape (or both)
- Score 3: extensive wear into dentinee, more than 2 mm^2 of occlusally/incisally exposed dentinee, and an occlusal/incisal totally lost structure, locally or generally.

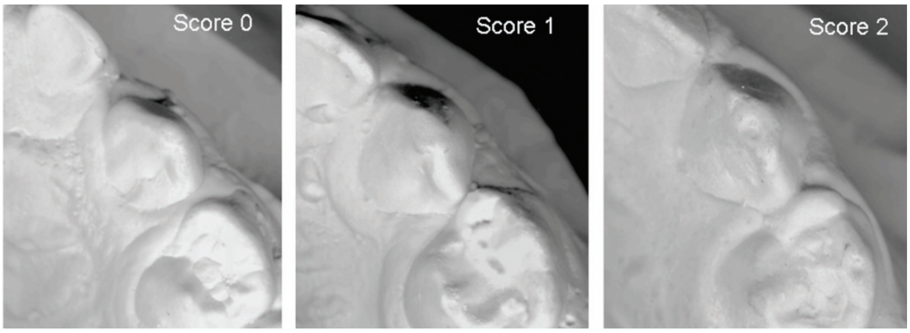

Fig. 2 Tooth wear score method (Knight *et al.*[12]) Score 0: no obvious wear facets in enamel, occlusal/incisal structure intact; Score 1: marked wear facets in enamel, occlusal/incisal structure altered; Score 2: wear into dentine, occlusally/incisally exposed dentine or occlusal/incisal shape changed in shape (or both)

Table 1 Tooth abrasion score for males (50s group and 90s group)

	50sG				90sG				
Tooth wear score	**0**	**1**	**2**	**3**	**0**	**1**	**2**	**3**	
Right C maxillary	0	2 (3.8%)	28 (52.8%)	23 (43.4%)	1 (2%)	10 (20%)	33 (66%)	6 (12%)	***
Right D maxillary	0	8 (15.1%)	44 (83%)	1 (1.9%)	1 (2%)	22 (44%)	27 (54%)	0	***
Right E maxillary	0	25 (47.2%)	28 (52.8%)	0	5 (10%)	32 (64%)	13 (26%)	0	**
Right maxillary segment (C+D+E)	0	35	100	24	7	64	73	6	***
Left C maxillary	0	3 (5.7%)	30 (56.6%)	20 (37.7%)	1 (2%)	12 (24%)	33 (66%)	4 (8%)	***
Left D maxillary	0	8 (15.1%)	45 (84.9%)	0	1 (2%)	18 (36%)	31 (62%)	0	**
Left E maxillary	0	25 (47.2%)	28 (52.8%)	0	1 (2%)	38 (76%)	11 (22%)	0	***
Left maxillary segment (C+D+E)	0	36	103	20	3	68	75	4	***
Right C mandibular	0	7 (13.2%)	29 (54.7%)	17 (32.1%)	1 (2%)	13 (26%)	34 (68%)	2 (4%)	***
Right D mandibular	0	6 (11.3%)	46 (86.8%)	1 (1.9%)	0	13 (26%)	37 (74%)	0	*
Right E mandibular	0	17 (32.1%)	36 (67.9%)	0	1 (2%)	20 (40%)	29 (58%)	0	NS
Right mandibular segment (C+D+E)	0	30	111	18	2	46	100	2	***
Left C mandibular	0	8 (15.1%)	31 (58.5%)	14 (26.4%)	0	13 (26%)	33 (66%)	4 (8%)	**
Left D mandibular	0	8 (15.1%)	45 (84.9%)	0	0	12 (24%)	38 (76%)	0	NS
Left E mandibular	0	15 (28.3%)	38 (71.7%)	0	0	24 (48%)	26 (52%)	0	*
Left mandibular segment (C+D+E)	0	31	114	14	0	49	97	4	**
Total	0	132	428	76	12	227	345	16	***

* P = 0.05; ** P = 0.01; *** P = 0.001
Legend: C primary canines, D primary first molars, E primary second molars

The degree of tooth wear on the maxillary and mandibular primary canines, the first primary molars and the second primary molars was calculated because tooth abrasion has a faster evolution on primary teeth,[13] which should present physiologically reduced enamel width.[14]

The recorded data for the two groups were organised for statistical evaluation as follows: degree of abrasion of single teeth and degree of abrasion of single posterior segments of the dental arch (maxillary and mandibular posterior segments, each one consisting of the primary canine, the first primary molar and the second primary molar).

The following measurements were taken for maxillary and mandibular arch on dental casts using a sliding caliper:

1. Posterior segment (right and left): the distance between the mesial surface of the first permanent molar and the mesial surface of the primary canine
2. Anterior segment (right and left): the distance between the mesial surface of the primary canine and the mesial surface of the permanent central incisor
3. Mesiodistal size of each permanent incisor
4. Interincisal midline diastema
5. Available space, calculated as the sum of anterior segments and interincisal midline diastema minus the sum of the mesiodistal sizes of the teeth
6. Maxillary intermolar width: distance between the central fossae of right and left first maxillary molars
7. Mandibular intermolar width: distance between the tips of the distobuccal cusps of right and left first mandibular molars
8. Posterior transverse interarch discrepancy (PTID): difference between maxillary and mandibular intermolar widths
9. Maxillary intercanine width: distance between the mesial margin of right and left maxillary primary canine
10. Mandibular intercanine width: distance between the tips of the cusps of right and left primary canine. If the cusp tips were abraded, the assumed centre of the abraded area was used
11. Anterior transverse interarch discrepancy: difference between maxillary and mandibular intercanine widths.

Table 2 Tooth abrasion score for females (50s group and 90s group)

	50sG				90sG				
Tooth wear score	0	1	2	3	0	1	2	3	
Right C maxillary	1 (2.1%)	7 (14.9%)	26 (55.3%)	13 (27.7%)	1 (2%)	14 (28%)	34 (68%)	1 (2%)	**
Right D maxillary	0	11 (23.4%)	33 (70.2%)	3 (6.4%)	3 (6%)	26 (52%)	21 (42%)	0	***
Right E maxillary	0	25 (53.2%)	22 (46.8%)	0	9 (18%)	34 (68%)	7 (14%)	0	***
Right maxillary segment (C+D+E)	1	43	81	16	13	74	62	1	***
Left C maxillary	1 (2.1%)	4 (8.5%)	26 (55.3%)	16 (34%)	1 (2%)	12 (24%)	36 (72%)	1 (2%)	***
Left D maxillary	1 (2.1%)	8 (17%)	36 (76.6%)	2 (4.3%)	3 (6%)	22 (44%)	25 (50%)	0	***
Left E maxillary	1 (2.1%)	20 (42.6%)	26 (55.3%)	0	8 (16%)	35 (70%)	7 (14%)	0	***
Left maxillary segment (C+D+E)	3	32	78	18	12	69	68	1	***
Right C mandibular	0	8 (17%)	35 (74.5%)	4 (8.5%)	1 (2%)	10 (20%)	39 (78%)	0	NS
Right D mandibular	0	5 (10.6%)	42 (89.4%)	0	4 (8%)	20 (40%)	26 (52%)	0	***
Right E mandibular	0	15 (31.9%)	32 (68.1%)	0	6 (12%)	30 (60%)	14 (28%)	0	***
Right mandibular segment (C+D+E)	0	28	109	4	11	60	79	0	***
Left C mandibular	0	7 (14.9%)	35 (74.5%)	5 (10.6%)	1 (2%)	13 (26%)	36 (72%)	0	*
Left D mandibular	0	8 (17%)	38 (80.9%)	1 (2.1%)	2 (4%)	21 (42%)	27 (54%)	0	***
Left E mandibular	0	19 (40.4%)	28 (59.6%)	0	9 (18%)	26 (52%)	15 (30%)	0	***
Left mandibular segment (C+D+E)	0	34	101	6	12	60	82	0	***
Total	4	137	369	44	48	263	291	2	***

* P = 0.05; ** P = 0.01; *** P = 0.001
Legend: C primary canines, D primary first molars, E primary second molars

Method error

Fifteen randomly selected models were remeasured to calculate the method errors for all the variables, as described by Dahlberg.[15] Any systematic error was determined by calculating the coefficients of reliability for all the variables, as suggested by Houston.[16] Method errors ranged from 0.00 to 0.66 mm. Corresponding coefficients of reliability ranged from 0.81 to 1.00. The reproducibility error for tooth abrasion scoring was also tested. Scores of the first and the second observations were statistically compared by means of a kappa test with Yates's correction in order to calculate the degree of reproducibility of concern. The result (0.94) expressed a high rate of reproducibility.

Statistical analysis

Descriptive statistics comprising prevalence rates for different abrasion scores were calculated.

The data from wear ratings and casts measurements of the two groups were compared separately for boys and girls using a nonparametric test (Mann-Whitney U-test) for independent samples (P <.05). All statistical computations were performed with a Statistical Package for the Social Studies (SPSS, Version 12.0, SPSS Inc, Chicago, Ill).

Table 3 Dental arch dimensions for females (50s group and 90s group)

	Females											
	1950s					1990s						
	N	Min	Max	Mean	S.D.	N	Min	Max	Mean	S.D.	Z	Sig
Posterior maxillary right segment	44	21.0	24.5	22.54	.74	46	20.0	25.0	22.66	1.06	-0.92	NS
Anterior maxillary right segment	44	11.5	17.0	14.28	1.26	45	9.5	17.5	14.86	1.68	-2.11	*
Upper interincisal diastema	44	0.0	4.0	1.27	1.07	45	0.0	4.5	1.07	1.14	-1.05	NS
Anterior maxillary left segment	44	11.0	17.0	14.34	1.59	45	10.0	17.5	14.94	1.39	-1.68	NS
Posterior maxillary left segment	44	21.0	27.5	22.65	1.10	46	20.0	25.0	22.58	1.04	-0.12	NS
Maxillary intercanine width	44	21.5	30.0	25.99	2.05	46	20.0	30.0	25.95	2.39	-0.17	NS
Maxillary intermolar width	44	41.0	48.5	44.51	2.03	46	38.5	48.5	43.42	2.46	-2.31	*
Mesiodistal size 12	24	5.5	9.0	7.06	0.76	37	5.5	8.0	6.86	0.67	-0.76	NS
Mesiodistal size 11	44	6.5	10.0	8.73	0.61	45	6.0	10.0	8.57	0.74	-1.34	NS
Mesiodistal size 21	44	6.5	10.0	8.73	0.61	45	6.0	10.0	8.57	0.74	-1.34	NS
Mesiodistal size 22	26	5.5	9.0	7.06	0.71	37	5.5	8.0	6.86	0.67	-0.72	NS
Maxillary available space	24	-6.5	4.5	-0.83	3.24	38	-6.0	6.0	0.60	2.86	-1.63	NS
Posterior mandibular left segment	44	21.5	26.0	23.10	1.08	46	21.0	26.5	23.11	1.13	-0.29	NS
Anterior mandibular left segment	44	7.0	13.0	10.89	1.10	46	8.5	13.5	10.90	1.13	-0.25	NS
Mandibular interincisal diastema	44	0.0	2.0	0.14	0.41	46	0.0	1.5	0.17	0.35	-1.14	NS
Anterior mandibular right segment	44	7.5	13.0	10.92	0.97	46	8.0	13.5	11.17	0.97	-1.29	NS
Posterior mandibular right segment	44	21.5	25.5	23.15	1.15	46	21.0	25.5	23.09	1.07	-0.21	NS
Mandibular intercanine width	44	22.0	32.0	25.31	2.03	46	21.5	30.5	25.38	2.24	-0.44	NS
Mandibular intermolar width	44	41.0	50.0	45.77	2.24	46	39.5	54.5	45.62	2.63	-0.83	NS
Mesiodistal size 32	38	5.5	7.0	6.05	0.40	41	5.0	7.0	6.08	0.50	-0.52	NS
Mesiodistal size 31	44	4.5	6.5	5.62	0.40	46	5.0	7.0	5.67	0.56	-0.09	NS
Mesiodistal size 41	44	4.5	6.5	5.64	0.39	46	5.0	7.0	5.67	0.56	-0.02	NS
Mesiodistal size 42	37	5.5	7.0	6.04	0.41	41	5.0	7.0	6.08	0.50	-0.62	NS
Mandibular available space	37	-6.0	4.0	-1.34	2.39	43	0.0	17.0	4.63	4.52	-0.89	NS
ATID	44	-3.5	5.0	0.68	1.89	46	-4.5	4.0	0.56	2.17	-0.05	NS
PTID	44	-4.0	1.0	-1.26	1.16	46	-8.0	-0.5	-2.2	1.61	-2.75	***

* P = 0.05; ** P = 0.01; *** P = 0.001
Legend: 12 and 22 permanent maxillary lateral incisors; 11 and 21 permanent maxillary central incisors.
32 and 42 permanent mandibular lateral incisors; 31 and 41 permanent mandibular central incisors.

RESULTS

Tooth abrasion

Descriptive statistics and statistical comparisons for the two examined groups are given in Tables 1 and 2. The comparison of the degree of abrasion for single teeth showed significant differences between the 50sG and the 90sG for almost all examined teeth, which appeared to be significantly more abraded in the 50sG. A significant smaller degree of abrasion in left and right, upper and lower posterior segments of the dental arches was found in the 50sG when contrasted with the 90sG. Absence of tooth wear (score 0) was observed in only four out of 1,200 teeth (0.33%) in the 50sG, whereas 60 out of 1,200 teeth (5%) were considered free of tooth wear in the 90sG. Extensive tooth wear (score 3) was assessed in 120 of 1,200 teeth (10%) in the 50sG and in only 18 out of 1200 (1.5%) in the 90sG.

Dental arch dimensions

Descriptive statistics and statistical comparison for the examined groups are reported in Tables 3 and 4. Both boys and girls of the 90sG showed significantly smaller maxillary intermolar width when compared with the 50sG. PTID was significantly minor in girls of the 90sG. A reduction of the anterior segments of the

Table 4 Dental arch dimensions for males (50s group and 90s group)

	Males											
	1950s					1990s						
	N	Min	Max	Mean	S.D.	N	Min	Max	Mean	S.D.	Z	Sig
Posterior maxillary right segment	39	21.0	25.0	23.27	1.03	38	21.5	25.0	22.97	0.88	-1.51	NS
Anterior maxillary right segment	37	11.0	18.5	14.96	1.64	37	10.5	17.5	15.08	1.59	-0.54	NS
Maxillary interincisal diastema	37	0.0	5.0	1.41	1.25	36	0.0	4.0	1.15	1.09	-0.86	NS
Anterior maxillary left segment	38	11.0	18.5	15.12	1.84	37	12.0	17.5	15.04	1.41	-0.26	NS
Posterior maxillary left segment	39	16.5	25.0	22.89	1.47	38	21.0	25.0	22.87	0.98	-0.72	NS
Maxillary intercanine width	39	22.5	34.5	27.09	2.48	38	22.0	31.0	26.61	1.85	-0.55	NS
Maxillary intermolar width	39	40.5	51.0	45.67	1.98	38	38.0	50.5	44.38	2.37	-2.62	***
Mesiodistal size 12	23	6.0	8.0	6.96	0.67	29	5.5	9.0	7.10	0.70	-0.81	NS
Mesiodistal size 11	32	8.0	10.0	8.98	0.47	35	7.0	9.5	8.71	0.55	-1.95	NS
Mesiodistal size 21	32	8.0	10.0	8.98	0.47	35	7.0	9.5	8.71	0.55	-1.95	NS
Mesiodistal size 22	23	6.0	8.0	7.00	0.64	29	5.5	9.0	7.09	0.70	-0.51	NS
Maxillary available space	22	-6.5	8.0	0.30	3.97	29	-5.0	7.5	0.52	3.25	-0.12	NS
Posterior mandibular left segment	39	22.0	26.0	23.77	1.14	38	22.0	25.0	23.68	0.93	-0.10	NS
Anterior mandibular left segment	39	9.0	14.0	11.33	1.03	38	10.0	16.0	11.45	1.16	-0.17	NS
Mandibular interincisal diastema	39	0.0	1.0	0.13	0.250	38	0.0	1.5	0.25	0.43	-0.93	NS
Anterior mandibular right segment	39	8.5	13.0	11.18	1.07	38	9.0	16.0	11.36	1.29	-0.32	NS
Posterior i mandibular right segment	39	22.0	26.0	23.86	1.09	38	22.0	26.0	23.76	1.00	-0.42	NS
Mandibular intercanine width	39	23.0	31.0	26.28	1.86	38	22.0	30.0	25.79	1.93	-0.96	NS
Mandibular intermolar width	38	44.0	53.5	46.92	2.08	38	42.0	50.0	46.20	2.11	-1.15	NS
Mesiodistal size 32	35	5.5	7.0	6.39	0.42	34	5.5	7.0	6.29	0.48	-0.90	NS
Mesiodistal size 31	39	5.0	6.5	5.90	0.42	37	5.0	6.5	5.74	0.44	-1.61	NS
Mesiodistal size 41	39	5.0	6.5	5.90	0.42	37	5.0	6.5	5.74	0.44	-1.61	NS
Mesiodistal size 42	36	5.5	7.0	6.38	0.42	34	5.5	7.0	6.29	0.48	-0.81	NS
Mandibular available space	35	-5.0	4.0	-1.94	2.27	34	-5.5	5.0	-0.90	2.30	-2.00	NS
ATID	34	0.0	21.0	6.77	5.07	34	0.0	13.5	4.31	4.45	-0.29	NS
PTID	39	-4.5	5.5	0.81	2.24	38	-2.5	3.5	0.82	1.43	-1.16	NS

P = 0.05; ** P = 0.01; *** P = 0.001;
Legend: 12 and 22 permanent maxillary lateral incisors; 11 and 21 permanent maxillary central incisors.
32 and 42 permanent mandibular lateral incisors; 31 and 41 permanent mandibular central incisors.

upper arch in girls of the 90sG on the left side was found, but the difference is clinically not relevant. No differences were found for all the other examined values.

DISCUSSION

The study of the transversal dental arch dimensions in relationship with tooth wear in the primary dentition is relatively unique and the findings of our analysis provide useful information concerning Italian young people in two samples separated by 30 years. The authors, in order to fulfil a more valid investigation, have selected children coming from a restricted geographical area with a limited ethnically heterogeneous population.

Various authors have reported an increased prevalence of malocclusion during the last few hundred years.[4,17-19]

The 'disuse theory' described by Corruccini and Whitley[20] explains the increasing diffusion of malocclusions in the last decades giving great importance to decreased function of the masticatory system, which should be responsible for insufficient development of the jaws. Similar considerations were made by Price[3] who studied Gaelic communities in the Outer Hebrides, Eskimos and Indians of North America, Melanesian and Polynesian South Sea Islanders, African tribes, Australian aborigines, New Zealand Maori, and the

Indians of South America, observing a very poor incidence of dental diseases and malocclusions. Specifically in Eskimos, he observed perfect occlusions until the contact with industrialised societies[21] and later the incidence of malocclusion increased to 50% with the introduction of a diet based on processed foods.[22]

Different explanations were given by Begg,[23] who suggested that the loss of interproximal hard tissues, due to attrition, could be able to provide enough space for permanent teeth to achieve an adequate alignment.

The findings of our study indicate that untreated subjects, in the mixed dentition, observed in the last ten years, show a significant reduction of the width of the upper arch when compared with subjects observed 40 years ago in accordance with the findings of Lindsten *et al.*[6-8]

This can be interpreted as a sign of lack of function in modern subjects as a consequence of processed food, on the basis of the positive association between masticatory function and the development of the jaws. This association has been experimentally demonstrated on animal samples in numerous studies.

Beecher and Corruccini[24] made an association between moderate differences in the hardness of the diet and the narrowing of the maxillary arch in the rats. They suggested that mediolateral maxillary growth depends on the stimulation of the muscles provided by rough elements in the diet. The same authors found the equivalent results with a population of rhesus macaques, baboons and other non-human primates.[25-27]

Bouvier and Hylander[28] microscopically examined the same sample and found fewer secondary Haversian systems in the mandibular corpus. Ciochon *et al.*[29] found a 25% greater size of the deep masseter, superficial masseter and temporalis weight in minipigs fed with hard food in comparison with minipigs supplied with soft food. Another important cause of the narrowing of the upper arch in modern populations, is the amplified prevalence of mouth breathing [30] with a consequent respiratory disease increase such as allergy and asthma.[31-34]

Lindsten *et al.*[35] suggested that many contemporary children frequently chew gum, and for this reason, a change in the dietary consistency cannot be ruled out as a causative factor of the narrowing of the maxilla. Consequently, mouth breathing has to be considered a major cause of the narrowing of the maxillary arch in modern populations. A tendency toward a reduction of the posterior transverse intermolar dimension was found in children born in the 1990s in relation to their coetaneous born in the 1950s: PTID is a fundamental sign of various malocclusions. Tollaro *et al.*[36] have shown that a negative PTID exists in dental arches with Class II malocclusion (3.4 mm on average) and seemingly normal buccal relationships. The stimulation of the muscular structures due to hard and fibrous food allows a major development of the dental arches, resulting in a greater functional stimulation of the masticatory muscles and an increased occlusal wear.[37,38] There was no difference between the two groups for the dimensions of the posterior segments, which contrasts with the results of Lindsten *et al.*[5] who found larger spaces in the posterior segment in children born in the 1980s when compared with those born in the 1950s. They hypothesised that there was a change in the lateral arch space conditions during the last decades because of the decline in caries prevalence occurring in the same period. The different findings of our study may be due to the selection of the samples, because the absence of caries was an inclusionary criterion for subjects involved in our study. The other causes of loss of proximal tooth material of posterior teeth, such as interproximal wear, are lacking in modern populations and are not able to cause a reduction of the transversal length of the posterior segments of the arch in the mixed dentition. The interproximal tooth wear represent a condition related with the dietary consistence.[39]

Tooth abrasion can be considered as a physiological condition in the deciduous dentition, with its pattern indicating the functional relationship between the dental arches.[40] The degree of tooth abrasion differs in different populations and ethnic groups in relation to dietary habits. Eskimos, North American Indians, and Greek mountaineers, for instance, showed a great extent of abrasion as a result of coarse and rough food diets.[10]

Occlusal abrasion allows an adequate sliding between the dental arches, which is a necessary condition in order to achieve a functionally correct development of the masticatory system.[39,40]

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

The wear of occlusal surfaces of primary teeth is a physiological condition in the deciduous and mixed dentitions.[10] The lack of dental wear is one of the recognised aetiologic 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.[11,39,41]

Past investigations identified a large amount of tooth wear in primitive populations, where the prevalence of malocclusions was lower when compared with current groups.[10,42-52]

Previous studies have shown an increasing prevalence for certain malocclusions in the past 30 years of last century.[5,6] The aim of this study was to test whether there has been a significant increase or decrease in the amount of wear of deciduous teeth during the same period, due to an occlusal aspect, possibly correlated to malocclusions.

Previous studies[5,6] about 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 masticatory activity decrease 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 a lack of physiological changes in the dental arches.[11,41]

On the contrary, the use of hard and fibrous food is associated with a greater diameter of the dental arches, with increased wear of occlusal surfaces and with a smaller probability of occurrence of anomalous occlusal patterns.[10] The simultaneous presence of underdeveloped jaws and unworn teeth may be a cause of dental interferences and forced guidance of the mandible in an incorrect position in the sagittal or transverse plane, with a consequential malocclusion.[11,41]

CONCLUSION

The sample of Italian children selected, coming from the geographical area of Tuscany and born in the 1990s, show significantly reduced occlusal tooth wear and transverse intermolar maxillary width in comparison with a sample of children born in the 1950s and coming from the same geographical region.

This association can partially explain the greater risk of developing malocclusions in contemporary children compared with children living 35 years before.

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