A comparison of mesio-distal crown dimensions of the permanent teeth in subjects with and without fluorosis

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SUMMARY This investigation was undertaken to compare the mesio-distal crown dimensions of the permanent teeth in subjects with and without fluorosis. For this study, 25 pairs of study models cast immediately from alginate impressions of children from each of the two groups were evaluated. Their mean ages were 13.9 \pm 1.6 and 13.9 \pm 1.4 years, respectively. A dental vernier calliper was used to record the maximum mesio-distal dimensions.

Analysis of the study models showed that there were no statistically significant differences between the left and right sides (P > 0.05). The results indicated that the mesio-distal crown diameters were consistently larger in the subjects with non-fluorotic permanent teeth. With the exception of the mandibular first premolars, there were no statistically significant differences in the mesio-distal crown diameters of the two groups.

Introduction

Dental fluorosis results from the ingestion of fluoride over a prolonged period of time during tooth formation. It has been previously reported (Usmen, 1976; Hapçıoğlu, 1992; Usmen *et al.*, 1997) that the prevalence and severity of dental fluorosis in the central Isparta populations of Turkey are substantially higher than expected for fluoride levels in drinking water (2.16–4.30 p.p.m.).

In orthodontics, the diagnosis and treatment of malocclusions requires accurate knowledge of tooth dimensions, as a stable occlusion is often reliant on the correct intercuspation of the teeth (Andrews, 1972). Several studies have reported tooth size variations between and within different racial groups (Keene, 1979; Bishara *et al.*, 1989; Turner and Richardson, 1989). However, no study has investigated crown dimensions in subjects with and without fluorosis. The purpose of this investigation was, therefore, to compare the mesio-distal crown dimensions of the permanent teeth in subjects with and without fluorosis.

Material and method

The material for the present study consisted of 25 pairs of study models of randomly selected children from Isparta who had fluorotic teeth. Their mean age was 13.9 ± 1.6 years (minimum 12 years; maximum 16 years). The models of 25 subjects without fluorosis were obtained from the archive at the Department of Orthodontics, Ankara University, Turkey. Their mean

age was 13.9 ± 1.4 years (minimum 12 years; maximum 16 years). All children were Caucasian. The inclusion criteria were:

- the presence and complete eruption of all permanent teeth in both arches, including first molars;
- the absence of any primary teeth;
- intact dentition with no caries or fractures;
- no conservative treatment other than Class I occlusal restorations;
- no congenitally absent teeth in any of the segments.

The impressions for all the study models were made in alginate material and cast immediately in plaster to prevent dimensional changes.

The study models were numbered for easy identification and measurements were carried out using a dental vernier calliper (Dentaurum 042-751-00; Ispringen, Germany). The maximum mesio-distal dimension was recorded for the incisors, canines, premolars and molars. These measurements were taken to the nearest 0.1 mm. Double measurements were recorded for each parameter. Discrepancies greater than this limit necessitated a new set of measurements and the nearest two measurements were averaged.

A statistical analysis was carried out using the Student's *t*-test in the Statistical Package for Social Sciences 7.5.2 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean, standard deviation and coefficient of variation (= standard deviation \times 100/mean) were computed for the two samples.

Results

Discussion

There were no significant left–right side differences in teeth with or without fluorosis.

Descriptive statistics for the maxillary mesio-distal crown dimensions of the fluorotic and non-fluorotic teeth are presented in Table 1. No significant difference was found for any measurement in the maxillary mesio-distal crown dimensions of the fluorotic and non-fluorotic teeth. The teeth with fluorosis consistently exhibited larger mesio-distal tooth widths than those without fluorosis in both arches.

Table 2 shows the descriptive statistics for the mandibular mesio-distal crown dimensions of the fluorotic and non-fluorotic teeth. There was no statistically significant difference in the mandibular mesio-distal crown dimensions for any measurement except the mandibular first premolars (P < 0.05). The fluorotic teeth consistently exhibited larger mesio-distal tooth widths than the non-fluorotic teeth in both arches.

The present investigation compared the mesio-distal crown diameters in fluorotic and non-fluorotic groups.

Subjects with malocclusions have been hypothesized as having different sized teeth and, hence, a possible cause for the malalignment. Studies, however, have shown no differences in tooth size when compared with those with normal occlusions (Howe *et al.*, 1983; Crosby and Alexander, 1989). However, in a recent investigation, Ta *et al.* (2001) reported tooth size discrepancies among different occlusion groups of Chinese children. Therefore, in the present study, only subjects with near normal occlusions were included.

Although measurements on dental casts are reported to be on average 0.1 mm larger than those of actual teeth, dental cast measurements seem more reliable than those made directly in the oral cavity (Hunter and Priest, 1960) and, therefore, analysis of study models seems appropriate in this form of investigation.

 Table 1
 Descriptive statistics for the maxillary mesio-distal tooth diameters (mm).

Tooth	Side	Fluorotic $(n = 25)$			Non-fluorotic ($n = 25$)			<i>t</i> -value	Significance
		Mean	SD	CV	Mean	SD	CV		
I1	R	8.83	0.47	5.31	9.14	0.76	8.32	1.76	NS
	L	8.74	0.50	5.70	9.03	0.80	8.82	1.52	NS
I2	R	7.14	0.58	8.08	7.30	0.68	9.24	1.32	NS
	L	7.15	0.57	7.92	7.40	0.68	9.22	1.39	NS
С	R	8.13	0.61	7.44	8.18	0.55	6.76	0.31	NS
	L	7.93	0.50	6.27	8.10	0.60	7.36	1.07	NS
PM1	R	7.29	0.43	5.87	7.50	0.46	6.12	1.66	NS
	L	7.31	0.47	6.41	7.50	0.50	6.67	1.34	NS
PM2	R	7.07	0.48	6.77	7.29	0.54	7.45	1.52	NS
	L	6.95	0.39	5.60	7.09	0.40	5.65	1.31	NS
M1	R	10.75	0.57	5.29	10.81	0.64	5.86	0.35	NS
	L	10.56	0.57	5.35	10.66	0.55	5.18	0.67	NS

SD, standard deviation; CV, coefficient of variation; NS, not significant.

 Table 2
 Descriptive statistics for the mandibular mesio-distal tooth diameters (mm).

Tooth	Side	Fluorotic ($n = 25$)			Non-fluorotic ($n = 25$)			<i>t</i> -value	Significance
		Mean	SD	CV	Mean	SD	CV		
I1	R	5.81	0.30	5.13	6.00	0.44	7.36	1.71	NS
	L	5.68	0.42	7.37	5.93	0.39	6.60	2.11	NS
I2	R	6.25	0.45	7.18	6.42	0.54	8.38	1.21	NS
	L	6.21	0.46	7.39	6.35	0.50	7.85	0.99	NS
С	R	7.08	0.39	5.42	7.17	0.46	6.42	0.72	NS
	L	7.01	0.51	7.23	7.01	0.39	5.56	0.00	NS
PM1	R	7.20	0.42	5.86	7.48	0.53	7.06	2.07	*
	L	7.10	0.36	5.03	7.42	0.60	8.11	2.17	*
PM2	R	7.32	0.46	6.29	7.49	0.55	7.31	1.21	NS
	L	7.28	0.45	6.13	7.47	0.47	6.27	1.45	NS
M1	R	11.17	0.64	5.69	11.48	0.57	4.92	1.81	NS
	L	11.00	0.60	5.43	11.18	0.59	5.23	1.07	NS

SD, standard deviation; CV, coefficient of variation; NS, not significant.

CROWN SIZE WITH AND WITHOUT FLUOROSIS

Bilateral asymmetry in the present sample was not found to be statistically significant. Therefore, averaging the size of the teeth would not significantly affect the distribution. This agrees with the usual practice that teeth on one side of the jaw or the average of the two sides can be used to analyse the size of teeth (Margetts and Brown, 1978; Yuen *et al.*, 1997).

The results of this study indicate that the mean mesiodistal tooth sizes for all teeth were not significant. However, the mean mesio-distal tooth sizes for all teeth were larger in the non-fluorotic groups. The difference varied between 0.06 mm for the maxillary right first molar to 0.31 mm for the maxillary right first incisor. In the mandible it ranged from 0.09 mm for the right canine to 0.32 mm for the left first premolar. The non-fluorotic sample therefore demonstrated larger mesio-distal tooth dimensions of approximately 2.15 and 2.36 mm in the maxilla and mandible, respectively.

The findings cannot be compared with previously investigated parameters, because of differences in the grouping of the subjects. The results of this study could provide useful clinical information for orthodontists and restorative dentists in fluorotic areas.

Conclusions

The maxillary mesio-distal crown dimensions of fluorotic teeth were not significantly different to normal teeth.

With the exception of the mandibular right and left first premolars, there were no significant differences in mesio-distal crown dimensions between subjects with and without fluorosis.

Further work with a larger number of participants and in different areas should be undertaken to compare fluorotic and non-fluorotic groups.

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