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Sizes of Deciduous Teeth in 47,XYY Males

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INTRODUCTION

The sizes of the permanent teeth of men with an extra Y chromosome (47,XYY) have been studied recently [1]. The findings suggested that excess dental growth may have occurred in prenatal life, but definitely occurred postnatally before the age of 3 years. It was concluded that the factor or factors influencing excess growth continues during development of the permanent teeth at least up to 7–8-years-old.

The present paper studies the sizes of the deciduous teeth in 47,XYY males to obtain additional information about the growth of these individuals.

SUBJECTS AND METHODS

Six Finnish 47,XYY individuals (T. K., J. T., J. H., M. L., T. A., and T. H.) were examined. At the time of dental examination, they ranged in age from 7 to 18-years-old. The controls were Finnish schoolchildren from urban (Turku) and rural (Hailuoto) communities and three relatives of three 47,XYY subjects.

Dental casts made from impressions of the upper and lower dentitions of each study subject were used for measurements. Measurements of maximum mesiodistal (m-d) and labiolingual (l-l) dimensions were made on each available tooth crown by the investigator (M. K.) as previously described [2]. There were no gross morphological abnormalities or defects in the deciduous teeth of the six 47,XYY males. For statistical comparisons, the *t* test was used.

RESULTS

Table 1 gives individual measurements and means of mesiodistal and labiolingual dimensions of the crowns of deciduous teeth from the right side of the jaw of 47,XYY males and the control population. If a measurement was missing on the right side, it was replaced by the measurement of the antimere, if possible.

The results show that the deciduous teeth of 47,XYY males are generally larger than those of control males; the trend is clear for both mesiodistal and labiolingual dimensions of the teeth in the upper and lower jaw. The statistical testing of the results shows that in some comparisons the differences are significant even though there are only six 47,XYY males. When the tooth sizes of female controls, male controls, and 47,XYY males are compared, the control male and female values appear closer to each other than the values of the 47,XYY and control males.

DISCUSSION

The results indicate that the quantitative determination of the primary teeth of XYY

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TABLE 1

SIZES OF DECIDUOUS TEETH OF 47,XYY FINNISH MALES AND CONTROLS

DIMENSION AND TOOTH	47,XYY MALES								CONTROLS					
									MALES				FEMALES	
	T. K.	J. T.	J. H.	M. L.	T. A.	T. H.	Mean Size (mm)	SD	Mean Size (mm)	SD	No.	Range (mm)	Mean Size (mm)	No.
Upper Jaw, Right Side														
Mesiodistal:														
di_1	...	...	6.8	...	...	...	...	...	6.5	0.5	22	5.3–8.0	6.4	23
di_2	...	...	5.2	...	6.2	5.9	5.8*	0.5	5.3	0.4	40	4.5–6.1	5.2	40
dc	7.8	7.3	...	...	...	7.0	7.4*	0.4	6.9	0.3	98	6.1–7.8	6.8	97
dm_1	8.2	7.4	...	...	...	7.1	7.6	0.6	7.2	0.4	74	6.0–8.2	7.0	78
dm_2	10.2	9.6	10.3	...	...	9.5	9.9*	0.4	9.0	0.5	75	7.4–10.3	9.1	77
Labiolingual:														
di_1	...	...	5.1	...	...	...	...	...	5.1	0.4	29	4.5–6.3	5.0	29
di_2	...	...	5.0	...	5.3	5.4	5.2	0.2	5.0	0.4	50	3.9–6.1	5.0	47
dc	6.8	6.2	6.5	...	...	6.4	6.5	0.3	6.2	0.4	100	5.2–7.2	6.1	102
dm_1	9.6	9.0	9.4	...	...	9.3	9.3†	0.3	8.7	0.5	83	7.6–9.6	8.6	92
dm_2	10.6	10.4	10.9	...	...	10.3	10.6‡	0.3	10.1	0.5	83	8.6–11.3	9.9	95
Lower Jaw, Right Side														
Mesiodistal:														
di_1	...	...	4.3	...	...	...	...	...	4.1	0.4	14	3.5–4.7	4.1	19
di_2	...	...	5.3	...	...	...	...	...	4.7	0.4	27	4.0–5.2	4.7	35
dc	...	6.0	6.1	...	...	6.3	6.1	0.2	5.9	0.3	85	5.1–6.8	5.9	87
dm_1	8.4	...	...	...	...	...	...	...	8.0	0.5	41	7.0–9.7	7.7	53
dm_2	...	11.0	...	...	...	10.4	10.7*	0.4	9.9	0.6	39	8.3–11.3	9.8	51
Labiolingual:														
di_1	...	...	4.6	...	...	...	...	...	3.9	0.3	13	3.5–4.3	3.9	18
di_2	...	...	4.9	...	...	...	...	...	4.4	0.3	28	3.7–4.8	4.4	36
dc	...	5.7	5.7	...	...	5.7	5.7	0.0	5.7	0.3	91	4.8–6.6	5.6	93
dm_1	8.5	7.8	...	...	...	...	8.2†	0.5	7.3	0.4	60	6.2–8.4	7.3	84
dm_2	...	9.7	...	9.6	...	9.6	9.6‡	0.1	9.1	0.5	51	7.3–10.9	9.0	69

NOTE.—di_1 = central incisor; di_2 = lateral incisor; dm_1 = first molar; dm_2 = second molar; and dc = canine.

* = $P < .05$.

† = $P < .01$.

‡ = $P < .1$.

males is also affected by the factor or factors that influence excess permanent tooth growth. This is not an entirely unexpected finding because there is a low positive correlation between sizes of primary teeth and their permanent successors. Also, a low positive correlation exists between body size (standing height) and tooth size.

Because there are no data concerning dental maturation of the primary teeth of XYY males in the very early stages of development, the following timing appraisals are approximations.

Timing of Excess Growth

Beginning with the first incisors, the completion of the crown formation of the primary teeth varies between 1½ and 11 months of postnatal life [3]. The last primary teeth to achieve crown formation are the second molars. Consequently, the present results indicate that, at the latest, excess dental growth of XYY males is apparent and final 1 year after birth and that before the first months of postnatal life, the factors influencing excess growth are in effect. The maximum time needed for the growth excess is approximately 9 months for incisors and 18 months for second molars, beginning in the seventh or eighth week in utero. If the mitotic activity has a decisive role in the growth excess as suggested [1], the time would be much shorter, and the factors influencing excess growth must be active early in fetal life. The present results also show that the influence on excess growth of primary dentition is continuous and does not seem to be selective for the different teeth and dimensions.

Nature of Excess Growth of 47,XYY Individuals

There are three likely explanations for the larger than average deciduous tooth sizes in 47,XYY individuals. (1) Teeth of the relatives of 47,XYY individuals are large too. (2) The endocrine function of 47,XYY individuals differs from that of normal males and favors growth excess. (3) There is a growth factor in the Y chromosome, and two Y chromosomes in the same genome have an additive effect on growth.

Inheritance. When deciduous tooth sizes of three 47,XYY males and their three brothers were compared, it was found that in 15 of the possible 24 individual comparisons, tooth sizes of 47,XYY males were larger than their brothers; in six cases, the trend was reversed, and in three, the values were equal. Although these comparisons do not show the significant differences that the comparisons to the control sample do, the results suggest that large deciduous teeth of 47,XYY males are not a familial feature.

Endocrine function. There is no information available concerning hormone production of the 47,XYY males in the early stages of development. However, reports on hormonal production, especially testosterone and growth hormone, in 47,XYY adult males show that in spite of exceptionally high or low values, the hormone levels are generally within normal limits [4].

Genetic influence of Y chromosome. The finding by Alvesalo [1] that the Y chromosome carries genes regulating quantitative variation of the teeth in normal males suggests that the extra Y chromosome might cause the observed size differences (i.e., the Y chromosome may have a size-increasing effect together with its regulative function). It also became evident that the factor or factors affecting excess growth in

47,XYY males are working continuously from early fetal life, and their influence on both deciduous and permanent dentition seems to be of the same quantitative magnitude. Although dental maturation in 47,XYY males is somewhat late [1], the observations indicate that excess dental growth is a developmentally stable process. Thus, the existence of an extra Y chromosome in the genome does not seem to drastically change the holistic regulation of dental growth.

SUMMARY

Deciduous teeth of six 47,XYY males have been examined, and the tooth sizes were found to be larger than those of controls. We concluded that a factor or factors which influence excess dental growth in 47,XYY males are probably in effect before the age of a few months. The time needed for the achievement of final tooth growth excess seems to be limited to a 9–18 month period. It also became evident that excess dental growth of 47,XYY individuals is a developmentally stable process, and the Y chromosome apparently regulates quantitative variation of the teeth in normal males [2]. These observations on tooth sizes in 47,XYY males suggest a chromosomal influence on dental determination.

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