

Frequency of hypodontia in relation to tooth size and dental arch width

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This study describes the frequency of hypodontia among all the children of the same age group in a Norwegian municipality and reports variations of some dimensions of the dentition associated with hypodontia. Congenitally missing permanent teeth, not including third molars, were found in 7.1 per cent of the material at age seven, and in 6.6 per cent at age nine. The difference seemed to be due to insufficient mineralization of the second lower premolars in boys at age seven. The frequency of hypodontia per se was a little higher in girls than in boys, and the girls were missing more teeth per individual. Neither the dental arch width nor the mesiodistal diameter of the teeth were significantly different in the hypodontia group compared to a control group without hypodontia.

Key-words: Hypodontia; tooth; dental arch

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The clinical problems of hypodontia are related to diagnosis, frequency of missing teeth, and the effect on the remaining dentition.

The frequency of hypodontia varies, according to different investigators, from 0.27 per cent (Byrd, 1943) to 11.6 per cent (Hunstadbråten, 1964) depending on the methods of registration, grouping of the material and racial differences. In cases with extensive hypodontia (six or more missing teeth, third molars excluded), Lysell (1953) observed a reduced mesiodistal diameter of the remaining teeth, compared to Seipel's norms (Seipel, 1946). Grahnén (1956) also suggests that individuals with hypodontia have a reduced mesiodistal diameter of the teeth which are formed.

It is reported that absence of one or more of the third molars is accompanied by an increased frequency of agenesis of other permanent teeth (Grahnén, 1956; Garn & Lewis, 1962), and a reduction of the mesiodistal diameter of the remaining teeth (Baum & Cohen, 1971), with the greatest effect in the incisor region (Garn & Lewis, 1970). From these studies it thus seems that hypodontia is not an isolated anomaly, but rather a polymorphism related to the incidence of other missing teeth and a reduction in size of the remaining teeth.

This study was undertaken to find the most suitable age for an accurate hypodontia diagnosis, and at this age describe the frequency of congenitally missing teeth (third molars excluded) in a group of

Norwegian children. The purpose was also to investigate if the mesiodistal diameter of the first molars and central incisors was different in hypodontia individuals compared to a normal control group, and if the dental arch width varied.

MATERIAL AND METHODS

The material includes the children in a municipality outside Bergen, who in 1968 were seven years old. All the children, 385 girls and 428 boys, attended the Orthodontic Department, University of Bergen, for a routine orthodontic check, which included an orthopantomographic examination. The frequency of hypodontia, except third molars, were recorded from these orthopantomograms. In 1970 the children, now in their ninth year, were recalled and new roentgenograms were taken, and the frequency of hypodontia again recorded. At the same time alginate impressions were taken and plaster casts were made in hard stone.

Each child got a registration number. If a case showed hypodontia, the number next to it of the same sex and age served as a control for the measurements on the models. The metric analyses on the casts included the dental arch width dimensions and the mesiodistal diameters of the upper and lower central incisors and first molars. The width was measured from the most palatal point of the crown, perpendicular to the dental arch at the upper and lower

first molars and at the upper and lower deciduous canines. The mesiodistal diameters were measured according to *Seipel* (1946).

The first molars and upper central incisors represent tooth-groups which were not subject to hypodontia. The lower central incisors were selected to represent a tooth group which occasionally display missing teeth.

The magnitude of the error of measurement was calculated from double recordings of both the hypodontia and the control groups. A t-test did not reveal any systematic error, and the percentage error did not exceed 2.6 per cent. The mean of the double determinations was used in the further statistical evaluation of the material.

RESULTS

Frequency of hypodontia

The frequency of hypodontia was somewhat different when registered at age 7 and at age 9 (Table I). Totally, 7.1 per cent displayed missing teeth at 7 years, while only 6.6 per cent were registered at 9 years. This was due to a reduction of the number of boys with hypodontia. Girls displayed a higher frequency of missing teeth (8.1 per cent) than boys (6.3 per cent at age 7 and 5.6 per cent at age 9).

The distribution of the congenitally missing teeth showed that the lower second premolars were most frequently affected, followed by the upper second premolars,

Table I. *Frequency of hypodontia*

Age group	Total material			Individuals with hypodontia		
	Girls	Boys	Both sexes	Girls	Boys	Both sexes
7 years	385	428	813	31 (8.1 %)	27 (6.3 %)	58 (7.1 %)
9 years	385	428	813	31 (8.1 %)	24 (5.6 %)	55 (6.6 %)

Table II. *Frequency of hypodontia of different teeth*

Tooth	Number of missing teeth			
	Girls		Boys	
	Age 7	Age 9	Age 7	Age 9
5+5	18	18 (27.7 %)	15	15 (36.6 %)
5-5	32	32 (49.7 %)	19	15 (36.6 %)
2+2	9	9 (13.8 %)	7	7 (17.1 %)
1-1	6	6 (9.3 %)	4	4 (9.7 %)

the upper laterals and the lower centrals (Table II). The difference between hypodontia frequency in boys at age 7 and at age 9 was due to a reduction in the frequency of missing lower second premolars when registered at the higher age. Approximately 80 per cent of the hypodontia cases had either one or two missing teeth.

There was a general tendency towards more missing teeth in girls than in boys, the average being 2.1 in girls and 1.7 in boys. Boys were often missing only one tooth, while hypodontia of two or more teeth was frequently found in girls (Table III).

Absence of teeth was more frequent in the lower than in the upper jaw (58:48), and there was a slightly higher tendency to more missing teeth on the left than on the right side (55:51).

There was greater incidence of unilateral hypodontia for all the affected

teeth, with the exception of the lower central incisors.

Model measurements

The mean mesiodistal diameter of the first molars and central incisors in individuals with hypodontia was tested against the means of the control group (t-test). In girls no significant differences were found, while in boys the lower first molars in the hypodontia group had a significantly greater mesiodistal diameter than the controls (Table IV).

Even when the tooth diameter of individuals with two or more missing teeth were tested against the control group, the differences were insignificant, and the same result was found when the upper and lower jaws were tested separately. The differences in arch width were small and did not display significant t-values (Table IV).

DISCUSSION

The varying results concerning frequency of hypodontia may either be a real population variation, or it may be explained by differences in methods of examination, as clinical observation is apt to give lower values than a systematic roentgenographic registration. In higher age groups it is also often difficult to

Table III. *Number of missing teeth in different individuals (n = 55) at age nine*

Number of missing teeth	Girls	Boys	Both sexes
1	12 (38.7 %)	16 (66.7 %)	28 (50.9 %)
2	12 (38.7 %)	3 (12.5 %)	15 (27.3 %)
3	1 (3.2 %)	2 (8.3 %)	3 (5.5 %)
4	5 (16.2 %)	2 (8.3 %)	7 (12.7 %)
5	0 (0.0 %)	1 (4.2 %)	1 (1.8 %)
6	1 (3.2 %)	0 (0.0 %)	1 (1.8 %)

Table IV. Comparison of the mean mesio-distal diameters and mean dental arch width dimensions in the hypodontia and the control groups

Measurement	Girls				Boys					
	Hypodontia group (n = 31)		Control group (n = 31)		Hypodontia group (n = 24)			Control group (n = 24)		
	\bar{x}	S.D. _k	\bar{x}	S.D. _k	t	\bar{x}	S.D. _k	\bar{x}	S.D. _k	t
6+	10.13	0.67	10.35	0.63	-1.22	10.54	0.67	10.36	0.53	1.13
+6	10.27	0.74	10.34	0.58	-0.43	10.47	0.67	10.30	0.56	0.89
1+	8.50	0.50	8.65	0.53	-1.08	8.67	0.42	8.75	0.70	-0.55
+1	8.50	0.49	8.54	0.53	-0.31	8.66	0.43	8.64	0.65	0.10
6-	10.65	0.64	10.70	0.78	-0.25	11.16	0.60	10.79	0.62	2.12*
-6	10.67	0.55	10.80	0.72	-0.71	11.19	0.53	10.78	0.55	2.34*
1-	5.30	0.33	5.45	0.35	-1.70	5.31	0.27	5.38	0.38	-0.78
-1	5.32	0.31	5.42	0.36	-1.13	5.32	0.33	5.38	0.36	-0.68
Width 6+6	32.05	2.05	31.73	2.20	0.59	33.16	2.66	31.86	2.59	1.83
» 03+03	24.56	2.18	24.90	1.69	-0.61	25.38	2.05	25.52	1.56	-0.28
» 6-6	30.49	2.07	30.86	2.10	-0.68	32.42	2.40	31.59	2.35	1.26
» 03-03	20.64	2.05	20.48	1.44	0.31	21.07	1.87	21.12	1.33	-0.10

* = significant at the 5 % level.

decide whether a missing tooth is extracted or congenitally missing.

The total frequency of hypodontia in this material corresponds fairly well with that obtained by *Grahnén* (1956), *Volk* (1963) and *Haavikko* (1971), while *Dolder* (1936), *Werther & Rothenberg* (1939), *Brown* (1957), *Glenn* (1961), *Ringquist & Thilander* (1969) and *Gimnes* (1963) reported a lower incidence. *Hunstadbråten* (1964), on the other hand, found a somewhat higher frequency.

Less teeth were missing at age nine than at age seven. The reason was that the mineralization of the lower second premolars in boys was insufficient to give adequate contrast on the orthopantomograms at age seven in all individuals. Intraoral roentgenograms probably would give other results, but are not so well suited for a routine orthodontic check.

Thus, too early registration of hypodontia may give a wrong diagnosis. Therefore, the registration at age six, as

advocated by *Ringquist & Thilander* (1969) should be followed by a re-examination at a higher age in order to verify the diagnosis. This also means that treatment due to hypodontia, i.e. extractions, especially in the lower jaw, should be postponed until the children are about nine years old.

The tendency for girls to display greater frequency of congenitally missing teeth was also observed by *Glenn* (1961), *Rose* (1966), *Ringquist & Thilander* (1969), *Egermark-Eriksson & Lind* (1971) and *Haavikko* (1971), whereas *Grahnén* (1956) found no sex difference.

The more frequent absence of teeth in the lower than in the upper jaw, as found in the present study, was also observed by *Dolder* (1936) and *Grahnén* (1956), while *Ringquist & Thilander* (1969) reported the frequency to be the same in both jaws. The observed difference between the left and the right side was too slight to be significant.

A majority of the hypodontia cases had only one tooth missing. This tendency was especially strong among boys, while the girls were often missing two or more teeth. Thus, not only was the frequency of hypodontia greater in girls, but the number of missing teeth was also greater.

This study did not include the frequency of missing third molars. It is, however, interesting that none of the children displayed hypodontia of other teeth than the upper and lower second premolars, the upper laterals and the lower central incisors. The greater variability of the more distal tooth in each tooth group was thus verified for the upper incisors and the premolars, and the exception from this general tendency, namely the greater variability of the lower central incisors was also confirmed. This distribution of hypodontia is in accordance with *Grahnén* (1956), whereas *Haavikko* (1971) reports occasional hypodontia also of other teeth, especially in girls.

It has been shown that hypodontia of one or more mandibular third molars is associated with an increase in the prevalence of other missing teeth (*Grahnén*, 1956, *Garn & Lewis*, 1962, *Garn, Lewis & Vincinus*, 1962) and even alterations in the morphology of the teeth (*Keene*, 1965; *Davies*, 1968).

Lysell (1953) reported reduction of the mesiodistal diameters in individuals with multiple hypodontia and *Grahnén*, (1956) found the same tendency. By converting mesiodistal tooth measurements into T-scores (*Garn*, 1955; *Garn & Lewis*, 1970) compensating for sex and morphological class, most authors also report a crown size reduction in the remaining teeth (*Garn, Lewis & Kerewsky*, 1964; *Hanihara, Masuda & Tanaka*, 1965; *Keene*, 1964; *Garn & Lewis*, 1970; *Baum & Cohen*, 1971).

In this study, where the two sexes were kept separate, and the control group was drawn from the same population as the hypodontia group, and only homologous teeth were compared, it was found convenient to evaluate the material without great mathematical modifications. Consequently, the actual mesiodistal diameters were used in the statistical analyses.

In girls there was a general tendency to a reduced mesiodistal diameter in the hypodontia group, but the difference was not statistically significant. In boys there was a greater variation. Some teeth were slightly smaller in the hypodontia group, but the lower first molars were significantly greater. It should also be noted that the lower central incisors, which are occasionally subject to hypodontia, and therefore probably more apt to show size variations, did not differ significantly from the control group.

The results were similar also when the measurements from individuals with two or more missing teeth were tested against the control group. The mean of the measurements corresponded well with similar investigations on other Scandinavian materials (*Seipel*, 1946; *Fredriksen*, 1972).

A general tendency for a tooth size reduction was thus found only in the female group, whereas the results varied in boys. It is likely, therefore, that a greater material is needed to determine definitely the tooth size pattern of hypodontia individuals.

The width of the dental arches was approximately similar in the hypodontia and control groups. It should be noted, however, that these measurements may give different results if evaluated at a higher age when persisting second temporary molars, or mesial migration of the first molars due to extraction of temporary molars in hypodontia cases may

complicate the situation and affect the results.

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