Journal of Orthodontics/Vol. 27/2000/315–318

An Analysis of the Skeletal Relationships in a Group of Young People with Hypodontia

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Abstract. *The objective of this investigation was to examine the dentofacial features of a group of patients with hypodontia, in particular assessing whether cephalometric analysis confirmed the clinical assumption of a reduced lower face height, and to determine the relationship of these facial features with different numbers of missing teeth. It took the form of a cephalometric study, undertaken in a dedicated Dental Hospital clinic for patients with hypodontia. The study group comprised 59 patients seen on the Hypodontia Clinic: 32 females, 27 males, mean age 13·1 ± 3·1 years (range 6–23 years). The average number of missing teeth was 7 (SD 5), ranging from 1 to 21. The mean SNA, SNB, and MMA angles were within normal limits, but there was a statistically significant reduction in the MMA when more than one tooth type was missing (P = 0·007) and the ANB angle decreased as the number of missing tooth types increased (P = 0·034). The mean values for the whole sample were within the normal range and did not demonstrate any feature specific to the group, but patients with more severe hypodontia showed tendencies to a Class III skeletal relationship and a reduced maxillary-mandibular planes angle.*

Index words: Hypodontia, Cephalometric analysis.

Introduction

Hypodontia is the developmental absence of one or more teeth, excluding the third molars (Goodman *et al*., 1994). The prevalence in the general population is between 3·5 and 6·5 per cent (Brook, 1974), whilst a survey of 6000 orthodontic patients gave a prevalence of 4·3 per cent, with the lower second premolar followed by the upper lateral incisor being the most frequently missing teeth (Rose, 1966). The absence of one or two teeth is relatively common, but severe hypodontia (six or more missing teeth) is rarer and may be associated with a syndrome such as ectodermal dysplasia (Hobkirk and Brook, 1980).

Previous cephalometric studies of these patients have shown a reduced lower face height and increased overbite (Woodworth *et al*., 1985; Dermaut *et al*., 1986), together with a number of other dentofacial features, some agreeing and some contradictory. Whilst Woodworth *et al*. (1985) found a reduced lower face height, Roald *et al*. (1982) found that the lower face height was normal. Direct comparisons between studies is complicated by the varying severity of hypodontia of the sample groups, in addition to the cephalometric analysis used (Sarnas and Rune, 1983; Woodworth *et al*., 1985; Yuksel and Ucem, 1997). A recent study (Yuksel and Ucem, 1997) subdivided their group of patients according to the location of the absent tooth and investigated the effect of the site of location of hypodontia on dentofacial features.

Comprehensive management of hypodontia is best undertaken in interdisciplinary clinics, and these have been established in a number of centres for diagnosis, treatment planning and co-ordination of treatment (Hobkirk *et al*., 1994). A dedicated clinic for patients with hypodontia has run for 5 years at Newcastle Dental Hospital, with over 150 new patients seen. The most significant presenting complaints were poor appearance and lack of function. On clinical examination, in addition to the expected reduction in tooth number and variations in tooth morphology, there was a clinical perception that patients had a reduced lower face height and increased overbite.

The objectives of the present study were thus to examine the dentofacial features of a group of patients with hypodontia, in particular whether cephalometric analysis confirmed the clinical perception of reduced lower face height and to determine the relationship of these facial features with different numbers of missing teeth.

Material and Methods

Patient Selection

Fifty-nine out of 150 patients seen on the Hypodontia clinic were included in the study, selection being based on the presence of a lateral cephalometric radiograph. The group

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0301-228X/00/040000+00$02.00

consisted of 32 females and 27 males with a mean age of 13·1 ± 3·1years (range 6–23 years). Clinical details recorded from the Hypodontia database were age, sex, site, and number of missing teeth (excluding third molars), family history, and any known syndrome.

Cephalometric Analysis

All radiographs were digitized by one operator using GELA, a geometric digitizing program (Consultant Orthodontists Group, British Orthodontic Society). The landmarks used in this study are shown in Figure 1.

The cephalometric measurements used to identify skeletal and dental features of individual patients were:

1. SNA, SNB, ANB.
2. MMA (maxillary-mandibular planes angle).
3. LFH (lower facial height).
4. TFH (total facial height).
5. FP (facial proportions).
6. OJ (overjet).
7. OB (overbite).
8. UI–MAX (upper incisor to maxillary plane angle).
9. LI–MAND (lower incisor to mandibular plane angle).
10. UI–LI (inter-incisor angle).
11. LI–APo (lower incisor to the Apo line).

The malocclusions were classified according to the British Standards Institute classification for incisors (BS4492, 1969). The skeletal pattern was recorded from the cephalometric radiographs and the Eastman standard values (Mills, 1983) were used as the norm for comparison. Eleven of the 59 radiographs were re-digitized and re-analysed 4 weeks after the first digitization to estimate the repeatability of the measurement technique. The mean differences between digitizations varied between measurements made. Analysis of the difference between the two assessments showed an acceptable degree of accuracy. The estimate between measurement SD for SNA was 1·0 degree, for SNB was 0·6 degrees, for MMA was 0·9 degrees, for LFH was 0·3 mm, for TFH was 0·6 mm, for FP was 0, for OJ was 0·3 mm, for OB was 0·3 mm, for UI–MAX was 1·1 degrees, for LI–MAND was 1·0 degrees, and for LI–APo was 0·5 mm.

In order to examine the effect of the severity of hypodontia on dentofacial features, the group was subdivided according to the number of missing tooth types (incisors, canines, premolars, and molars). Group A had only one tooth type missing, Group B had two tooth types missing (usually incisors and premolars), Group C had three tooth types missing, and Group D had at least one tooth of each type missing.

Statistical analysis was undertaken using ANOVA, with *post-hoc* Tukey tests to examine the data for the effect of missing teeth upon cephalometric values.

Results

The mean ages of the subgroups are shown in Table 1. Figure 2 shows the distribution of the numbers of missing teeth. The average number of missing teeth was seven (SD 5) and ranged from 1 to 21. The proportion of patients with the different tooth types (incisors, canines, premolars, and molars, both maxillary and mandibular teeth) missing, is shown in Figure 3. It can be seen that, although any of the permanent teeth has the potential to be congenitally absent,

TABLE 1 *Mean age of each subgroup based on number of missing tooth types*

Group	No. tooth types missing	No. patients	Mean age (years)	SD (years)
A	1	16	12·1	2·7
B	2	22	13·3	2·5
C	3	12	13·4	3·5
D	4	9	13·9	4·4

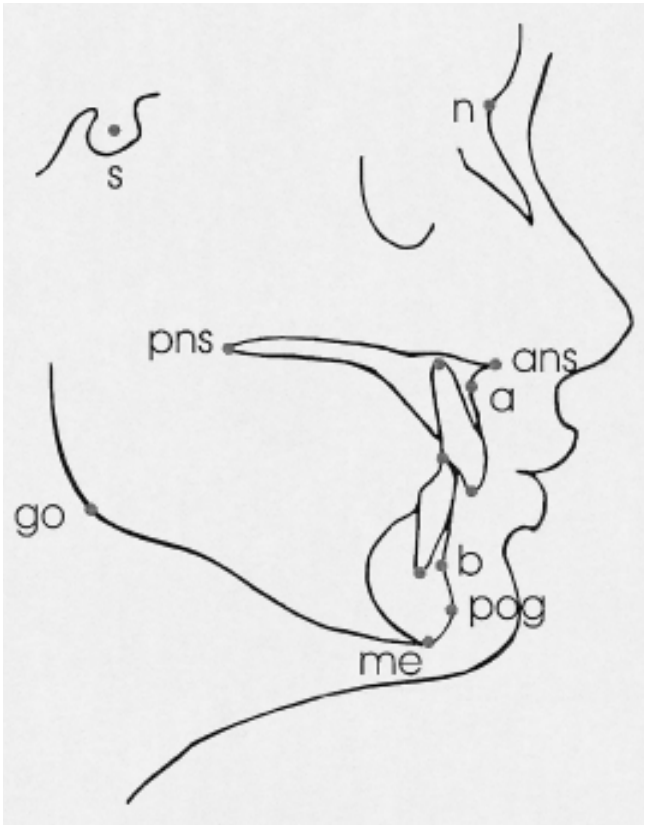

FIG. 1 Cephalometric landmarks used in this study.

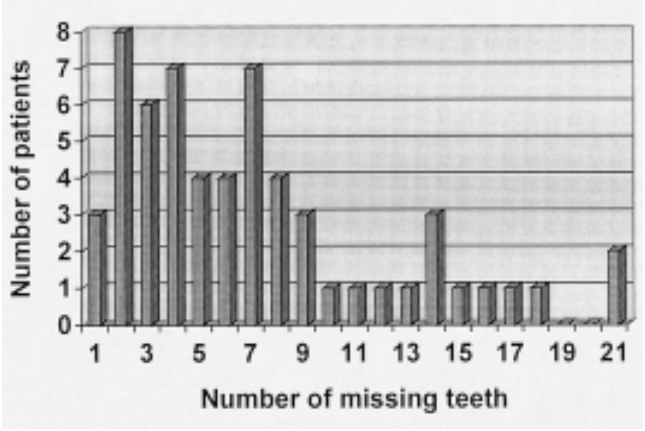

FIG. 2 Distribution of the numbers of missing teeth by patients.

the second premolars and upper lateral incisors were most commonly missing. Thirty-seven per cent of patients had a family history of hypodontia and 7 per cent of young people with hypodontia had an associated syndrome. The distribution of malocclusions is shown in Table 2.

Table 3 shows the cephalometric measurements for the whole group. The mean SNA, SNB, and MMA angles were within the normal limits, but there was a wide variation in the size of these angles. The dento-alveolar findings demonstrated that the upper and lower incisors were slightly retroclined, at 105·6 and 86·9 degrees, respectively, in comparison with normal values. All other measurements were within normal limits in comparison with the Eastman values.

The cephalometric data for the subgroups is shown in Table 4. Statistical analysis of the subgroups revealed a statistically significant reduction in the MMA when more than one tooth type was missing ($P = 0{\cdot}007$) and the ANB angle decreased as number of missing tooth types increased ($P = 0{\cdot}034$). Both factors were independent of age.

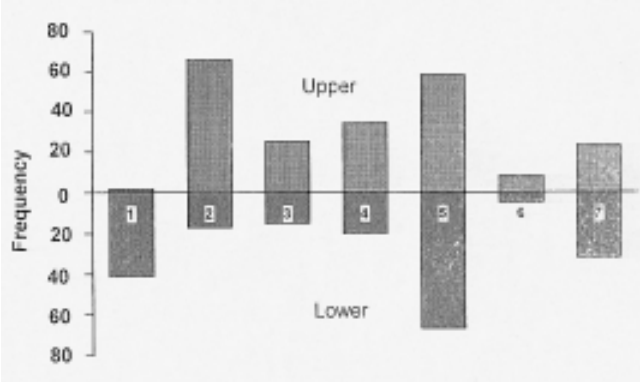

FIG. 3 Frequency of missing teeth by tooth type.

TABLE 2 *Distribution of skeletal patterns and malocclusions in the sample*

Malocclusion	Class I	Class II division 1	Class II division 2	Class III
No. of patients	18 (31%)	6 (10%)	15 (25%)	20 (34%)
Skeletal pattern	Class I	Class II	Class III	
No. patients	16 (27%)	12 (20%)	31 (53%)	

TABLE 3 *Cephalometric measurements of the whole sample*

	Mean	S.D	Range
SNA (degrees)	80·3	3·8	70·3–87·4
SNB (degrees)	78·9	4·2	70·3–93·5
ANB (degrees)	1·4	3·4	−7·7–8·7
MMA (degrees)	25·6	5·4	15·2–36·6
LFH (mm)	60·3	6·7	45·9–78·4
TFH (mm)	110·2	8·4	83·5–127·7
FP	0·55	0·03	0·47–0·64
OJ (mm)	1·9	3·2	−7·1–11·4
OB (mm)	3·7	2·5	−4·0–8·4
UIA (degrees)	105·6	7·5	86·5–129·3
LIA (degrees)	86·9	8·8	69·5–106·2
UI–LI (degrees)	141·8	12·1	117·2–177·7
LI–APo (mm)	0·2	3·1	−6·0–8·0

Discussion

A wide range of results has been reported in previous cephalometric studies of the dentofacial structure of patients affected by hypodontia. Roald *et al*. (1982) found little effect on the growth pattern when following a group of patients with hypodontia between the ages of 9–16 years and other workers (Dermaut *et al*., 1986; Yuksel and Ucem, 1997) have reported predominantly Class I skeletal patterns in their groups of patients. However, other studies (Wisth *et al*., 1974; Sarnas and Rune, 1983; Woodworth *et al*., 1985) have shown results which indicate smaller and more retrognathic maxillae in children with hypodontia. The subjects in this study had a greater proportion of Class III skeletal patterns as measured by the ANB angle and this tendency was particularly significant as the severity of hypodontia increased (more than one tooth type missing). However, this study population is skewed because only those subjects who had had a lateral skull radiograph taken were included in the study. Thus, extrapolation to the wider population with hypodontia must be made with caution.

The mean MMA of the whole sample in this study was within the normal range (25·6 degrees), but there was a wide range from 15·2 to 36·6 degrees. When analyses were undertaken of the subgroups, there was a significant reduction in the MMA with increasing severity of hypodontia. This is in agreement with the findings of Woodworth *et al*. (1985) who found a similar relationship in their sample of patients with missing upper lateral incisors, as did Øgaard and Krogstad (1995) who looked at differences in the relationship between craniofacial features with increasing severity of hypodontia. The latter studies both found a reduction in anterior lower face height. However, in this study the difference in the lower face height or the facial proportions and increasing severity of hypodontia was not apparent.

TABLE 4 *Cephalometric values for subgroups*

	Eastman norms	Group A ($n = 17$)	Group B ($n = 21$)	Group C ($n = 12$)	Group D ($n = 9$)
SNA (degrees)	81 ± 3	80·3 ± 2·8	81·0 ± 4·3	79·8 ± 2·8	79·0 ± 5·2
SNB (degrees)	78 ± 3	77·5 ± 2·1	79·1 ± 5·1	79·9 ± 4·7	79·5 ± 5·1
ANB (degrees)	3 ± 2	2·8 ± 3·0	1·9 ± 3·6	−0·1 ± 2·4	−0·5 ± 3·4
MMA (degrees)	27 ± 4	29·4 ± 5·4	24·4 ± 4·4	23·4 ± 5·5	24·8 ± 4·5
LFH (per cent)	55 ± 3	64·0 ± 7·2	58·6 ± 7·8	59·8 ± 7·8	58·6 ± 4·9
UIA (degrees)	109 ± 6	102·7 ± 6·5	106·2 ± 8·1	108·2 ± 8·4	106·0 ± 5·5
LIA (degrees)	92 ± 6	85·9 ± 8·0	89·8 ± 10·0	85·8 ± 7·7	83·1 ± 7·6
UI–LI (degrees)	132 ± 5	142·0 ± 10·9	139·5 ± 14·3	142·6 ± 11·5	146·1 ± 9·1

One study (Yuksel and Ucem, 1997) reported a tendency towards bimaxillary protrusion, which is contrary to the tendency of bimaxillary retroclination found in this study. Although the mean upper and lower incisor inclinations were towards the lower limits of normal, there was no significant relationship found with increasing numbers of missing teeth. By contrast, the study by Øgaard and Krogstad (1995) reported a significant incisor retroclination with increasing severity of hypodontia. Dermaut *et al*. (1986) found more deep bite cases in their study, but overall this was not seen in the patients in the present study.

Conclusions

The mean cephalometric values for the sample as a whole were within the normal range and did not demonstrate any feature specific to the group. However, patients with more severe hypodontia demonstrated tendencies to a Class III skeletal relationship and a reduced maxillary-mandibular planes angle.

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