

Dental Development in Cleft and Noncleft Subjects

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The development and eruption of the human dentition has been a source of investigation by numerous authors.¹⁻⁴ Garn, Lewis and Polacheck⁵ pointed out it was erroneous to assume that uniform rates of development are characteristic of the human dentition. Koski⁶ observed that girls on average were ahead of boys by some three percent overall. Hunt⁷ in a detailed study of the calcification, eruption and decay of the mandibular right first molar observed that precocious onset of calcification seemed more prevalent in girls than boys; however, this did not appear to be correlated with weight or size.

Sturdivant, Knott and Meredith⁸ in an analysis of serial study cases of fifty-seven boys from early childhood determined that variability of eruption age for teeth occurs. This variation appears least for the first molars, intermediate for the incisors, and highest for the canines and second premolars. In a study done by the author⁹ involving boys and girls from the age of three to twelve years it was observed that there was no statistically significant difference in eruption ages of individual teeth and their antimeres.

Regarding tooth eruption in cleft palate subjects, Fishman¹⁰ found that tooth eruption seemed delayed. The delay was particularly prevalent on the cleft-affected side and on patients with posterior cleft of the palate only. Tumey¹¹ reported that tooth eruption in individuals with clefts of the lip and/or palate exhibited some delay in tooth eruption and periods of sporadic development of the dentition.

Jordan, Kraus and Neptune¹² dis-

closed a significantly higher incidence of dental anomalies in the cleft population. This they felt was caused by the etiological factor or factors causing the cleft.

Menis, Largent and Vincent¹³ could find no significant relationship between skeletal age, recorded height and weight, and dental age in forty-eight cleft-affected children between the ages of five and eighteen years of age. Zilberman¹⁴ in a study of thirty-one cleft subjects observed tooth size to be smaller on the cleft side when compared with the noncleft side, and that dental anomalies were localized in the area of the cleft defect.

In a very complete study of dental anomalies occurring in cleft children, Bohn¹⁵ supported the findings of Zilberman.

METHODS AND MATERIALS

Serial dental analysis of eighteen youngsters was undertaken in this study. Ten of the children had bilateral complete clefts of the lip and palate and eight had left unilateral complete cleft of the lip and palate. The bilateral sample consisted of eight males and two females whose age range was from three years, six months to twelve years, eight months. The unilateral cleft sample consisted of six males and two females ranging in age from four years, eight months to thirteen years, ten months.

The records analyzed were obtained on an annual basis for each of the youngsters and consisted of study casts, lateral and frontal cephalometric x-rays, and left and right oblique cephalometric x-rays. These records are part

of a study of growth and development in handicapped children at the Childrens Hospital, Columbus, Ohio.

The developmental stage for each permanent tooth was compared with the stages of a chart derived from studies done at the Forsyth Dental Infirmary, Fels Research Institute and from the work of Nolla.⁴ The chart itself is based on serial longitudinal x-ray investigations of tooth development. The first radiographic sign of tooth development is the appearance of a radiolucent crypt containing the developing tooth germ. The appearance of the calcified crypt tip is next, followed by subsequent stages of crown calcification, tooth initiation, tooth development and tooth completion. The individual tooth development was analyzed by comparing the image present on the radiograph with the compatible formation stage on the dental development chart.

The data from the cleft sample were then compared to those compiled on the noncleft sample of fifteen males with a range of four years, two months to eleven years, eight months. The noncleft data were derived from the longitudinal growth and development study at the Department of Orthodontics, Ohio State University. None of the children in this sample displayed any unusual oral or craniofacial pathology. The comparison of the cleft sample to the noncleft male sample seemed more valid than a mixed sample of males and females since eighty percent of the bilateral cleft sample was male as was seventy-five percent of the unilateral cleft sample. Tooth eruption age, root completion age, and percentage of root completion at the time of eruption were compared between all three groups. In addition to this, the congenital absence of permanent teeth was recorded for each individual.

FINDINGS AND DISCUSSION

The mean eruption ages of the maxillary first permanent molars, the mandibular first permanent molars, and the maxillary and mandibular central incisors were compared for all three groups. The null hypothesis that delay in eruption of teeth is prevalent on the affected cleft side in persons having a cleft lip and palate was tested. The student's "t" test at the one percent level of significance was used to test this hypothesis. The results showed no statistical significant difference between eruption of individual teeth and their antimeres in both cleft groups studied, and as previously reported in the noncleft group. This was true for all four classifications of teeth studied.

As seen in Table I the unilateral cleft subjects were later in tooth eruption of the maxillary and mandibular first molars and the maxillary central incisors when compared with the bilateral and noncleft subjects.

The mandibular central incisors of all three groups studied showed little variation in age of tooth eruption, the maximum eruption age difference being six months between the noncleft groups and the unilateral cleft group.

In each tooth classification except one (mandibular left first molar) the bilateral cleft group was found to have eruption ages lying between the noncleft group and the unilateral cleft group.

There were no statistically significant differences in root completion ages of individual teeth and their antimeres (Table II).

The unilateral cleft subjects were later in root completion of the maxillary and mandibular first molars and the maxillary central incisors when compared with the bilateral and noncleft subjects. The mandibular central incisors of all three groups studied showed

TABLE I
AVERAGE AGE OF TOOTH ERUPTION

	<i>Max. Right</i> <i>Molar</i>	<i>Max. Left</i> <i>Molar</i>	<i>Mand. Right</i> <i>Molar</i>	<i>Mand. Left</i> <i>Molar</i>
Noncleft	6.72	6.92	6.72	6.79
Bilateral	7.06	7.45	7.06	6.32
Unilateral	7.68	7.96	7.76	7.96
	<i>Max. Right</i> <i>Incisor</i>	<i>Max. Left</i> <i>Incisor</i>	<i>Mand. Right</i> <i>Incisor</i>	<i>Mand. Left</i> <i>Incisor</i>
Noncleft	7.26	7.26	6.72	6.45
Bilateral	7.41	7.81	7.01	7.06
Unilateral	8.14	8.30	6.87	7.00

TABLE II
AVERAGE AGE OF ROOT COMPLETION

	<i>Max. Right</i> <i>Molar</i>	<i>Max. Left</i> <i>Molar</i>	<i>Mand. Right</i> <i>Molar</i>	<i>Mand. Left</i> <i>Molar</i>
Noncleft	8.26	8.39	8.05	7.85
Bilateral	8.51	8.31	8.17	7.56
Unilateral	9.89	9.23	9.01	8.76
	<i>Max. Right</i> <i>Incisor</i>	<i>Max. Left</i> <i>Incisor</i>	<i>Mand. Right</i> <i>Incisor</i>	<i>Mand. Left</i> <i>Incisor</i>
Noncleft	8.26	8.26	7.45	7.45
Bilateral	8.88	9.22	7.77	7.77
Unilateral	9.10	9.34	7.25	7.25

TABLE III
AVERAGE PERCENT OF ROOT COMPLETION AT
TIME OF TOOTH ERUPTION

	<i>Max. Right</i> <i>Molar</i>	<i>Max. Left</i> <i>Molar</i>	<i>Mand. Right</i> <i>Molar</i>	<i>Mand. Left</i> <i>Molar</i>
Noncleft	67	68	71	74
Bilateral	78	75	64	63
Unilateral	78	79	79	82
	<i>Max. Right</i> <i>Incisor</i>	<i>Max. Left</i> <i>Incisor</i>	<i>Mand. Right</i> <i>Incisor</i>	<i>Mand. Left</i> <i>Incisor</i>
Noncleft	71	71	72	78
Bilateral	76	73	74	74
Unilateral	87	90	88	91

little variation in age of root completion, the maximum difference being six months between the bilateral cleft and the unilateral cleft group.

Table III shows root development at the time of eruption ranged from ninety-one percent complete in the mandibular central incisor of the unilateral cleft group to sixty-three percent complete in the mandibular first molar of the bilateral cleft group.

The final area studied was the presence of a cleft and the congenital absence or malformation of teeth. Of the

ten bilateral cleft cases, eight had neither right nor left maxillary permanent lateral incisors. One child had the right permanent lateral incisor congenitally missing and the left permanent lateral incisor present but malformed. The last of the bilateral cleft cases had the maxillary left lateral incisor congenitally absent while the right lateral incisor was present but in the buccal rather than anterior maxillary segment.

The eight left unilateral cleft cases studied showed five left lateral incisors to be congenitally absent. Of the three

left lateral incisors present, one was malformed while the other two showed normal development.

There were no congenitally missing or malformed teeth in the noncleft sample.

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BIBLIOGRAPHY

1. Hurme, V. O.: Standards of variation in the eruption of the first six permanent teeth. *Child Develop.*, 19: 213-31, 1948.
2. Schour, Isaac and Massler, Maury: The development of the human dentition. *J.A.D.A.*, 28:1153-60, 1941.
3. Garn, S. M., and Lewis, A. B.: Relationship between the sequence of calcification and the sequence of eruption of the mandibular molar and premolar teeth. *J. Dent. Res.*, 36: 992-95, 1957.
4. Nolla, C. M.: The development of the permanent teeth. *J. Dent. Child.*, 27:254-66, 1960.
5. Garn, S. M., Lewis, A. B., Polacheck, D. L., Interrelations in dental development. I. Interrelationships within the dentition. *J. Dent. Res.*, 39: 1049-1055, 1960.
6. Garn, S. M., Lewis, A. B., Koski, K., Polacheck, D. L.: The sex difference in tooth calcification. *J. Dent. Res.*, 37:561, 1958.
7. Hunt, Edward E.: The permanent mandibular first molar. Its calcification, eruption and decay. *Am. J. of Phys. Anthro.*, 1:253-278, 1948.
8. Sturdivant, J. E., Knott, V. B., Meredith, H. V.: Interrelations from serial data for eruption of the permanent dentition. *Angle Orthodont.*, 32:1-13, 1962.
9. Haring, F. N.: Tooth eruption studies of noncleft children. Unpublished data presented to the Midwest component of the Edward H. Angle Society, January, 1971.
10. Fishman, L. S.: Factors related to tooth number, eruption time, and tooth position in cleft palate individuals. *J. Dent. Child.*, 1-4, July-August, 1970.
11. Tumey, D. L.: The development of the permanent teeth in cleft lip and cleft palate children. Unpublished masters thesis, Ohio State University, Columbus, Ohio.
12. Jordan, R., Kraus, B., Neptune, C.: Dental anomalies associated with cleft lip and/or palate. *Cleft Palate J.*, 3:22-25, 1966.
13. Menius, J., Largent, M. J., Vincent, C.: Skeletal development of cleft palate children as determined by handwrist roentgenographs: a preliminary study. *Cleft Palate J.*, 3: 67-75, 1966.
14. Zilberman, Y.: Observations of the dentition and face in clefts of the alveolar process. *Cleft Palate J.*, 10: 230-237, 1973.
15. Bohn, A.: Dental anomalies in hare lip and cleft palate, *Acta Odont. Scand.*, Vol. 21, 1963.