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MINERAL CONTENT OF UNERUPTED TEETH

by

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Marked departure from normal bone mineralization can readily be seen upon visual inspection of roentgenograms. Borderline cases with mineral changes of only a few per cent, however, cannot be readily seen; and these slight changes are often masked by differences in film density resulting from variations in exposure or processing techniques.

Babaianz (1947) and others have found that after 30 per cent decalcification of non-macerated bone, demineralization can be suspected roentgenographically. However, a loss of 50 per cent is necessary for the roentgen findings to be unequivocal (1). Therefore, many cases of borderline demineralization are missed in visual inspection of roentgenograms.

Many attempts have been made to measure the calcification of bone through step wedges and fixed exposure-development techniques (3—9, 11). Our method consisted in densitometric analysis of the calcification of unerupted teeth using the transmission densitometer of Bruno Lange, Berlin.

MATERIAL

The eruption of the permanent teeth extends over a considerable period of time, *viz.*, from the sixth year, when the first molars erupt, to the thirtieth year, when the third molars have usually made their appearance. There are, of course, individual

Table 1
 Unerupted Permanent Teeth in 997 Individuals

Age	Female	Male	Total
16—20	26/31*)	33/42	59/73
21—25	6/29	9/40	15/69
26—30	8/28	9/55	17/83
31—35	3/34	7/46	10/80
36—40	3/35	7/56	10/91
41—45	2/34	1/53	3/87
46—50	3/31	2/52	5/83
51—55	2/55	3/61	5/116
56—60	3/50	3/43	6/93
61—65	1/39	0/34	1/73
66—70	2/36	1/13	3/49
71—75	2/33	1/7	3/40
76—	0/52	0/8	0/60

*) 26 females out of 31 had unerupted teeth.

variations in the chronology of development of the teeth. The number of persons with unerupted permanent teeth in a series of 997 random consecutive cases is shown in Table 1. The numbers of unerupted teeth after the age of thirty years were as follows in order of decreasing frequency, 30 maxillary third molars, 27 mandibular third molars, 9 maxillary canines, and one mandibular canine. These 67 non-erupted teeth occurred in 46 persons (Table 1).

EVALUATION OF PERFORMANCE AND RESULTS

The densitometric analysis was evaluated with an orthopantomogram of the jaws, made through routine exposure procedures. A maximum of four measurements was made for each of the crowns of the teeth, as well as for the mandibular bone around the apices of the roots. The measurements covered an area of 2 mm in diameter. The fog density of the film was subtracted from the dental and mandibular density readings.

Fig. 1 illustrates calibration curves for the upper and the lower dentitions as a ratio between the dental and the mandibular densities. For the sake of clarity, both curves are shown on the same

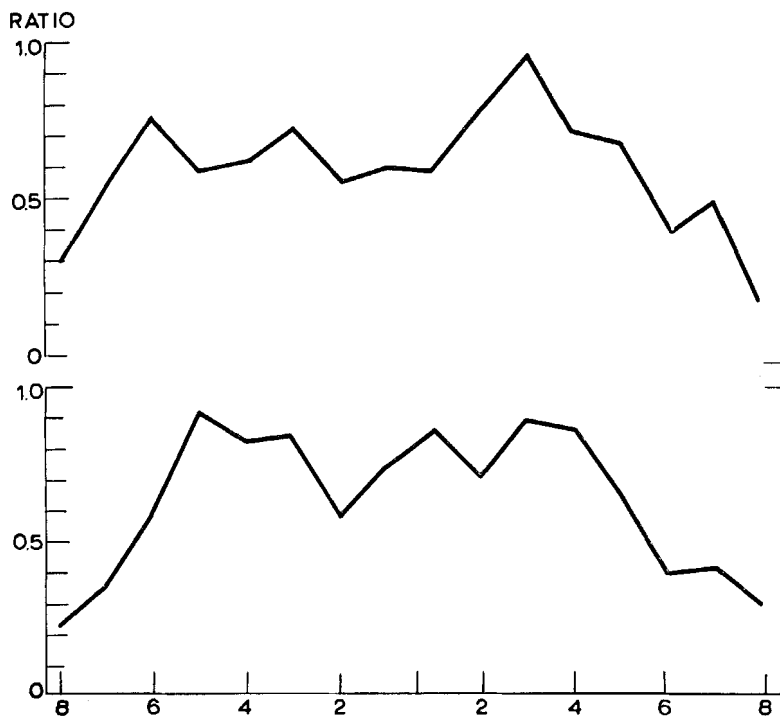
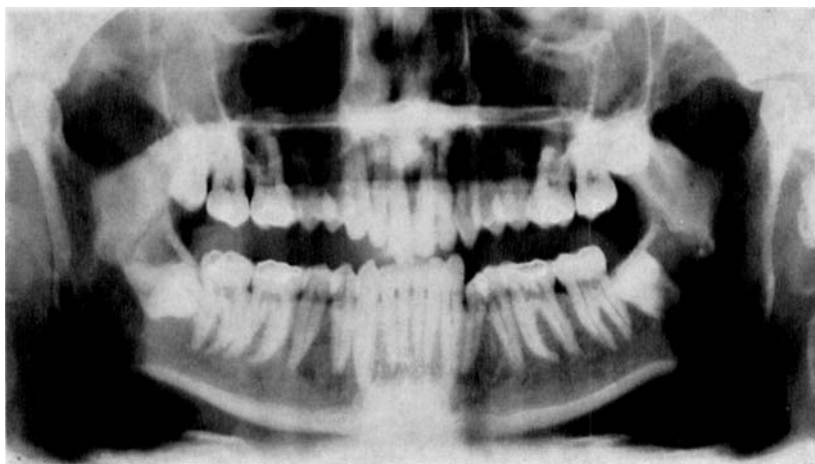


Fig. 1. Orthopantomogram and profile density curves for upper and lower dentitions. Scale at the bottom indicates dentition.

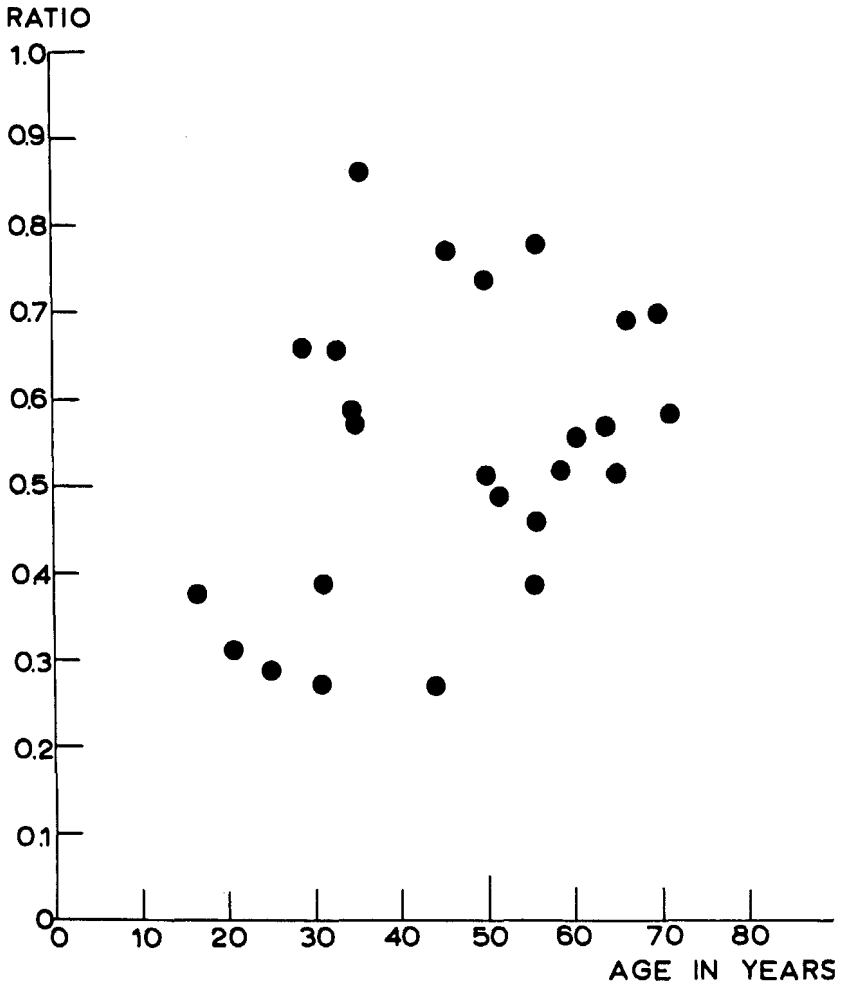


Fig. 2. The correlation between bone densitometric reading of unerupted teeth and the age.

chart as the orthopantomogram. It will be noted that there is a definite parallelism between the two curves.

The scatter diagram in Fig. 2 shows the correlation between the mineral content of the unerupted teeth and the age. The measurements were made on lateral skull films. The proximal portion of the ramus of the mandible was chosen as a standard.



Fig. 3. Lateral view of a middle-aged person. Unerupted upper right third molar protrudes into the maxillary sinus and shows diffuse dotted areas of radiolucency.



Fig. 4. Lateral view of an aged person showing unerupted right and left lower third molars. The teeth are ankylosed. There is a large resorption area in the crown of the left lower third molar.

This area is easily reproduced in a lateral film and represents two thin bones superimposed. The measurements covered an area of 10 mm in diameter for the crown and the mandibular bone. Here, again, the fog density of the film was subtracted from the dental and mandibular readings.

The ratio of the density of the unerupted teeth to the mandibular standard was calculated and correlated with the age. The regression equation was

$$y = 0.4657 - 0.0039 x,$$

indicating a positive correlation between the mineral loss of unerupted teeth and the age.

DISCUSSION

The biological significance and the chemistry of some microelements in the enamel have been discussed, *e.g.*, by *Brudevold & Söremark* (2) and *Stafne* (10). The incidence of resorption of unerupted teeth is highest in the later decades of life, though in some instances it may occur early. The resorptive process

originates on the enamel surface (Fig. 3) or at the cemento-enamel junction, and, very rarely, on the surface of the cementum. It is preceded by degeneration of the enamel epithelium, following which the enamel comes in contact with the connective tissue which causes its resorption. The hard dental structures are destroyed and replaced by bone. The bone is less radiopaque than the tooth structure it replaces; therefore, the defect produced by the resorption is readily discernible in the roentgenogram (Fig. 4). When seen in roentgenograms, the defects have erroneously been interpreted as caries.

SUMMARY

The relationship between the roentgenographic density of unerupted permanent teeth and the age was determined. The mineral content of the crowns of teeth was measured through roentgenographic bone densitometry. A positive correlation was found between the demineralization of unerupted teeth and the age.

RÉSUMÉ

TENEUR EN MINÉRAUX DES DENTS N'AYANT PAS FAIT LEUR ÉRUPTION

L'auteur a déterminé le rapport entre la densité radiographique des dents permanentes n'ayant pas fait leur éruption et l'âge. La teneur en minéraux de la couronne des dents a été mesurée par densimétrie osseuse radiographique. Une corrélation positive a été trouvée entre la déminéralisation des dents n'ayant pas fait leur éruption et l'âge.

ZUSAMMENFASSUNG

MINERALGEGHALT NICHT-DURCHGEBROCHENER ZÄHNE

Das Verhältnis zwischen der röntgenographischen Dichte der nicht durchgebrochenen Zähne und dem Alter wurde bestimmt. Die Verkalkung der Krone in jedem Zahn wurde durch röntgenographische Knochen-Transparenzmessung bestimmt. Eine positive Korrelation zwischen der Demineralisation der nicht durchgebrochenen permanenten Zähne und dem Alter wurde festgestellt.

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