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Longitudinal aspects of gingival width

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Measurements of gingival width at upper and lower incisors in 30 male adults were compared to those taken five and a half years previously. A slight increase in gingival width at the upper incisors was found. At the lower incisors the width of the gingiva did not increase. The relevance of these findings with regard to the increase in lower face height in adults was discussed. It has been postulated that this increase occurs within the area of the alveolar processes and is due to eruptive movements of the teeth and their supporting tissues. The findings of the present study also point to an increase in gingival width. However, the findings must be interpreted with caution. It is questionable whether at the present time adequate techniques are available to measure changes in gingival width in adults, as the so called adult growth is almost imperceptibly small.

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Introduction

An increase in gingival width in adults has been reported by Ainamo and Talari (1976a, 1976b). It has been postulated by these authors, that the increase in gingival width is associated with an increase in face height. It was assumed that the eruption of the teeth and their supporting tissues in human adults compensates for a loss of facial height due to attrition of the occlusal surfaces of the teeth as has been concluded from skull studies (Hellman 1927, Herzberg & Holic 1943, Muphy 1959, Manson 1963); in the absence of attrition, this continuous eruption of the adult dentition leads to an increase in face height (of about 0.4 mm yearly); the vertical growth is thought to occur within the area of the alveolar processes. Ainamo and Talari based their conclusions on cross-sectional studies, using an orthopantomographic method.

Clinical data of gingival width of subjects which had taken part in a previous study by Grevers (1977), offered the possibility of investigating gingival width longitudinally. Thus, in the present study, an attempt was made to ascertain, whether the width of the gingiva increases with advancing age in young adults.

Materials and Methods

Grevers' data were collected five years and six months prior to this study. The subjects (all male) were now 23 to 30 years of age, the average age being 25 years. They were in the possession of 28 teeth, third molars excluded. On both occasions, gingival width was assessed by the wrinkle method (Coppes 1972). The change in the width of the gingiva at each tooth in the upper incisor region was calculated in thirty subjects, and in the lower incisor region in 29 subjects (one person who exhibited gingival recession in this area being excluded; gingival

recession was not scored in the original study, and so no information was available as to whether the recession occurred subsequently or was already present at that time). For each subject the mean change in gingival width of his upper and of his lower incisors was calculated. t-tests were used for the comparison of the data.

Results

The width of the gingiva of the upper incisors increased by a mean value of 0.3 mm (standard deviation 1.2 mm, $n = 120$, $p < 0.05$), and at the lower incisors a mean increase of 0.1 mm (standard deviation 1.1 mm, $n = 116$) was found. The mean increase in upper gingival width for the subjects was 0.3 mm (standard deviation 0.9 mm, $n = 30$, $p < 0.05$) and in lower gingival width 0.1 mm (standard deviation 0.8 mm, $n = 29$).

Discussion

The data on gingival width at the upper incisors showed a slight increase. At the lower incisors, no increase could be shown. As it was impossible to calibrate the examiner in the present study against the examiner in Grevers' (1977) study, the findings must be interpreted with caution. The reproducibility of the so called wrinkle method is satisfactory (Mazeland 1978). However, in clinical research or epidemiological surveys, when more than one examiner is involved, the examiners should be calibrated, as a systematic error is likely to exist.

Ainamo and Talari (1976a, 1976b) were a little premature in concluding that the width of the gingiva increases in adults, as these conclusions were based on cross-sectional studies, using an orthopantomographic method. Cross-sectional studies are of little value in determining whether and to what extent morphologic changes occur, as factors of selective survival and secular change influence the results to an unknown degree (Tanner 1962), and the orthopantomographic method is only appropriate for the comparison of large groups (Talari, Kilpinen & Ainamo 1975).

Uprighting of the incisors in adult life has been reported in different studies (Lysell & Myrberg 1971, Humerfelt & Slagsvold 1972, Forsberg 1976, 1979). It is also possible that a difference in axial inclination of the teeth contributed to the differences scored by an orthopantomographic method between the two age groups.

The findings of the present study also pointed to an increase in gingival width with advancing age. The association of continuous eruption of the teeth in adults and increase in lower face height is based on skull studies, in which tooth attrition is compensated for by an increase in alveolar process height. Considering tooth attrition a function of age, it is assumed that without attrition of the teeth, facial height would increase with advancing age (Hellman 1927, Herzberg & Holic 1943, Murphy 1959, Manson 1963). However, whether absence of tooth attrition results in an increase in lower face height can not be concluded from these studies. In a study of skulls of known sex and age the outcome pointed to a decrease of face height, and it was concluded that people get smaller as they get older (de Froe 1936).

Longitudinal aspects of growth can be assessed in detail only by longitudinal investigations. Longitudinal studies report a slight increase in lower face height during the third decade of life (Büchi 1950, Thompson & Kendrick 1964, Israel 1973, Forsberg 1976, 1979).

In young adults, especially in males, late maturation of some of the subjects can influence the outcome for the total group, and what is called adult growth, might possibly be delayed adolescent growth in a

few subjects. In the investigations mentioned above, no data concerning individual variation are presented. In the present study, the group was too small to allow for conclusions on the distribution of the individual results.

In adults where chondrocranial growth, condylar growth and sutural growth is supposed to have ceased (Björk 1966), four possible sites of growth can be associated with an increase in lower anterior face height (see Fig. 1):

1 appositional increase on the lower border of the symphysis (Israel 1973),
2 appositional increase at the crest of the upper anterior alveolar process (Ainamo & Talari 1976a, 1976b, Forsberg 1979),
3 appositional increase at the crest of the lower anterior alveolar process (Ainamo & Talari 1976a, 1976b),
4 eruption in the molar region resulting in a slight posterior rotation of the mandible and a compensatory adaption of the upper incisors to a more lingual inclination (Forsberg 1976, 1979), or in an increase in the distance Supradentale-Infradentale (SD–ID).

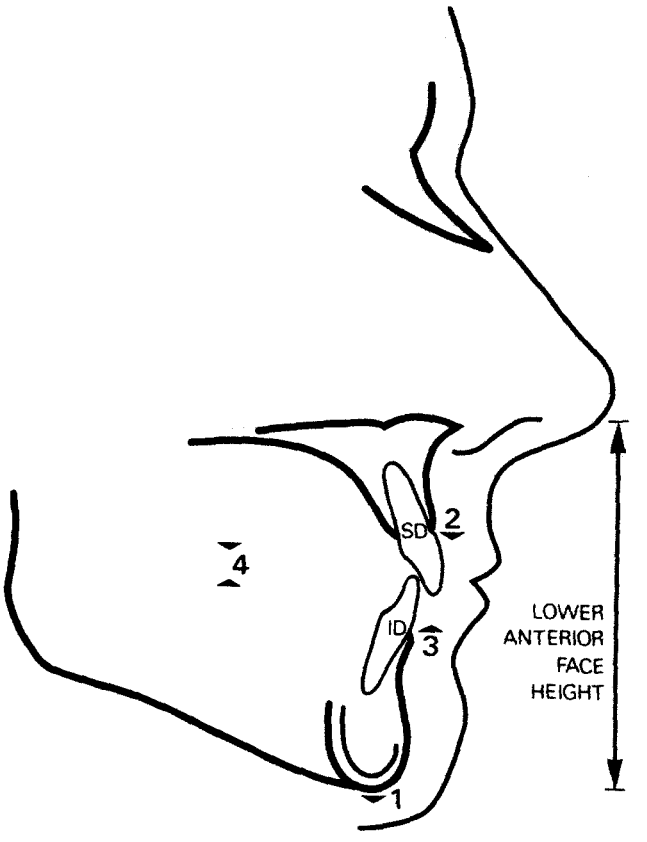

Fig. 1. Possible sites and directions of growth in adults.

Changes in lower face height in adults are small. Büchi (1950) found an increase in face height of 1.29 mm in men from age 20 to 29, Thompson and Kendrick (1964) found 0.37 mm increase in lower face height in one year and Forsberg (1976) reported an increase of 0.35 mm in lower face height from age 24 to age 29. A continuation of this study showed a further increase in lower anterior face height up to age 34 (amounting to 0.56 mm in ten years), with posterior rotation of the mandible. The upper incisors had adjusted themselves to the new lower jaw position and findings were suggestive of a downward movement of the upper front teeth (Forsberg 1979).

The results of the present study, i. e. increase of gingival width of the upper incisors, may point to analogous changes of the adult dentition. Extrusion and uprighting of front teeth are both associated with an increase in gingival width (Batenhorst, Bowers & Williams 1974, Boyd 1978, Dorfman 1978). In the present study no increase could be shown at the lower incisors. In Forsberg's (1979) study, the male subjects also showed no alterations in the anatomical relationships of the lower anterior region.

When methodological errors in clinical and cephalometric measurements are taken into account, the changes in the vertical dimensions of the lower face in adults during a period of five and a half years are almost impossible to quantify. If adult growth proceeds at the same rate during the fourth decade of life, it might be possible over a twenty year period to localize the most important site of growth, given a sufficiently accurate method of measurement.

In view of the fact that these require-

ments have not been met in studies of eruptive movements of teeth and increase in gingival width in human adults (e. g. Ainamo & Talari 1976a, 1976b, and the present study) any conclusions must be regarded with caution. However, even if the changes in later life are small and difficult to measure with present techniques, they could be of importance for the function of the masticatory system and merit further investigation.

From an epidemiologic point of view, changes in adult life are mainly characterized by breakdown and destruction, or, at the best, by a maintenance of a status quo (e. g. Björn 1974). In reconstructive dentistry, maintenance of a status quo, called: 'occlusal stability', is thought to be a conceptual basis for diagnosis, treatment and research (Graf & Geering 1977). In contrast to this static view, change and altering spatial relationships may be a physiological characteristic of the adult dentition.

Studies of normal, non pathological changes in the adult dentition must, of necessity, serve as a base for studies of "normal" destructive changes in human adults. The information from the above mentioned, cross-sectional studies on gingival width, bearing in mind their limitations, must be considered of much value as they point to a wide range of variation in the adult dentition in man.

Unfortunately, the present study yields no conclusive evidence on which to accept or to reject the hypothesis: whether the width of the gingiva increases with advancing age in young adults.

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