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Research Paper

The chronology of third molar mineralization by digital orthopantomography

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ABSTRACT

The present study was designed to determine the chronology of third molar mineralization to establish Indian reference data and to observe the advantages of digital orthopantomography. Therefore, a cross-sectional study was undertaken by evaluating 167 digital orthopantomographs in order to assess the mineralization status of the mandibular third molar of Caucasian individuals (85 males and 82 females) between the age of 14 and 24. The evaluation was carried out using the 8-stage developmental scheme of Demirjian et al (1973). The range, mean age, standard deviation and Student *t*-test are presented for each stage of mineralization in all four quadrants. Statistically significant differences between males and females were not found for all four third molars. All the individuals in this study with mature third molar were at least 18 years of age. For medicolegal purposes, the likelihood of whether an Indian is older than 18 years or not was determined. The advantage of digital orthopantomography in the interpretation of the tooth mineralization over the traditional method was acknowledged.

1. Introduction

Age estimation play a key role in assisting law enforcement authorities in identification, estimating the age at death, differentiation of cluster victims, narrowing the search possibilities of unknown victims, determining eligibility for social benefits and aiding immigration services in the processing of undocumented immigrants. Previous studies have demonstrated the reliability of using the human dentition as an estimator of chronologic age. Dental techniques that use progressive morphologic changes have proven to be the most accurate methods for estimating the ages of infants, children and adolescents compared to other methods of age estimation.[1–3]

As the human skeleton grow, only a few age-dependent features can be evaluated by morphological methods. Dentition and bone development are both affected by genetic, environmental, nutritional and endocrinal factors. But compared to bone, tooth mineralization stages are much less affected. Thus developing teeth provide a more accurate indication of chronological age.[4]

Several studies revealed strong correlation between third molar development and chronological age.[5–13] Because teeth are less likely to suffer from external events than all other parts of the body.[14,15] The focus is on the stage of maturity of the wisdom teeth because these are the only teeth to continue root mineralization after the age of 16, by which time apex closure is completed in all the other teeth. Although many studies have been conducted on determining age using stage of tooth development and eruption of teeth, relatively few have concentrated on the third molars, due to the lack of a universally accepted staging system of these teeth, characterized by their atypical morphology and development.[9,16,17]

Worldwide many researchers have studied on different populations regarding the reliability of third molar in assessing the legal adulthood by using the Demirjian's 8 stage classification and proved that stage H of development of third molar correspond to legal adulthood.

In India, the contractual legal age of majority is 18 nationally. As concluded by Mincer et al[17] in the ABFO study, the third molars may provide reasonable accuracy for the likelihood that a person is at least 18 year old rather than an exact age. The staging of third molar root mineralization can be accomplished easily and non-invasively through evaluation of dental radiographs. Majority of the studies till today have used the traditional technique of orthopantamograph (OPG) film.

Adoption of sophisticated information technologies in the

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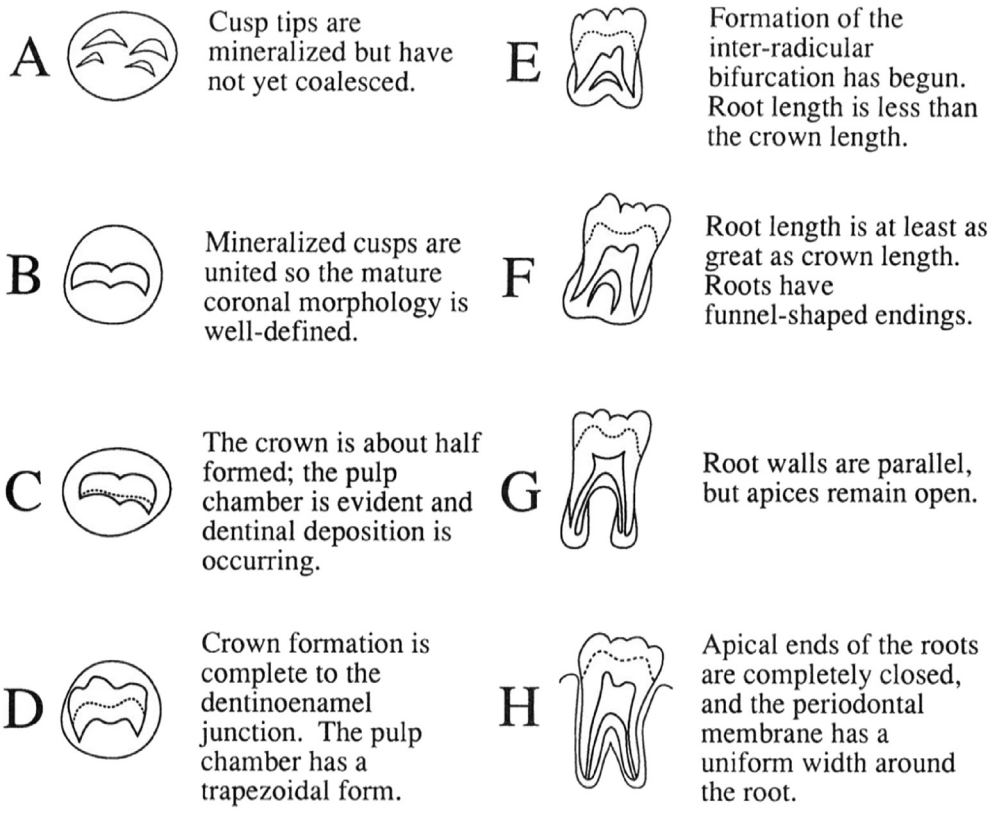

Fig. 1. Demirjian's 8-stage classification (from Demirjian et al, 1973, modified).

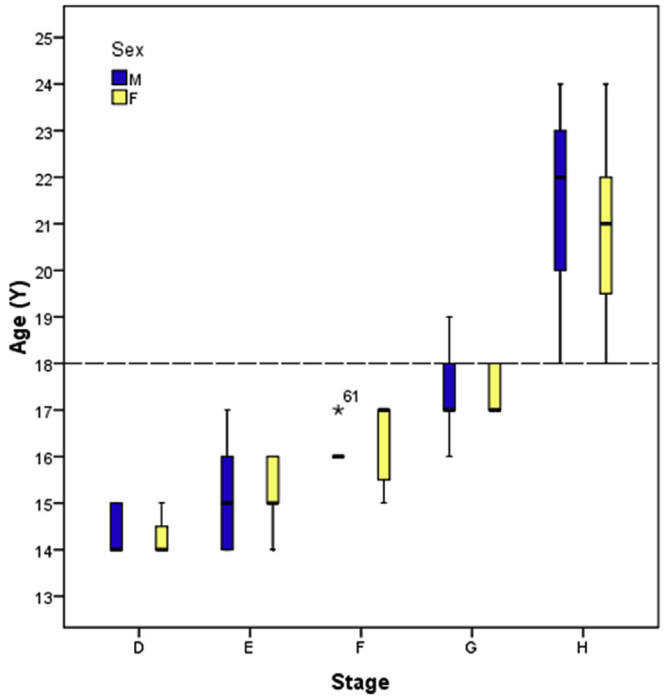

Fig. 2. Box plots of the correlation between chronological age and Demirjian et al's stages for tooth mineralization with reference line at 18 years and outlier marked (statistically) for URTM.

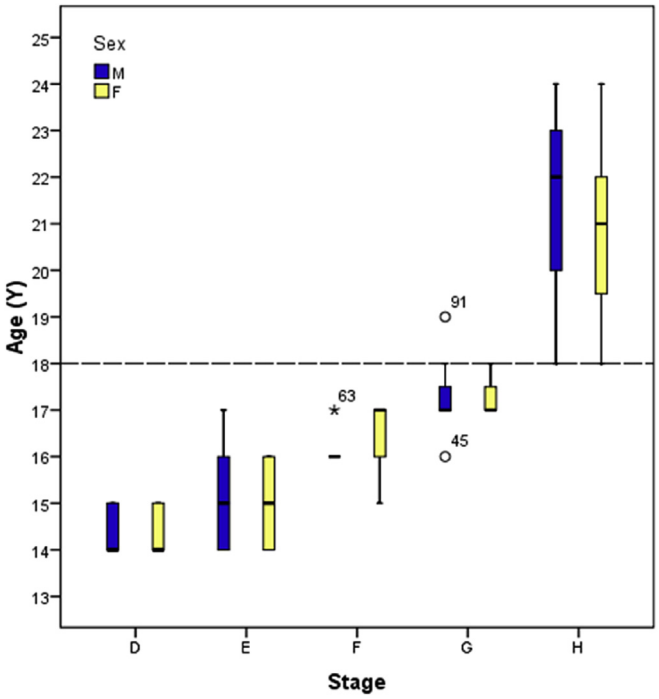

Fig. 3. Box plots of the correlation between chronological age and Demirjian et al's stages for tooth mineralization with reference line at 18 years and outlier marked (statistically) for ULTM.

clinical field has yielded a greater diagnostic precision. Computer processing of digital radiographs yields extremely precise diagnostic information because the image can be magnified and filtered down to the smallest level of detail, obtaining greater