F22 Accuracy and Precision of Third Molar Development as an Indicator of Chronological Age in African Americans

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The goal of this presentation is to define the chronology of third molar development in an African American population as a possible method of forensic age determination during late adolescence and early adulthood.

This presentation will impact the forensic community and/or humanity by providing forensic estimation of chronological age in adolescents or young adults of African descent, specifically in differentiating whether or not an individual is legally an adult.

This study proposes to assess the accuracy of using third molar development based on radiographically distinguishable stages of tooth formation in pre-existing diagnostic panoramic and periapical dental radiographs to determine chronological age in African Americans between the ages of 14 and 24 for forensic purposes, and to determine whether there are noteworthy differences from comparable previously studied populations of other racial and ethnic groups.

Stages of third molar development as depicted in panoramic and periapical radiographs from African American dental patients (n=244) in Memphis, Tennessee of known age and gender were used for the study. The majority of the cases (n=231) were evaluated using only panoramic radiographs. For a smaller number of cases (n=12) periapical films were used, and one case (n=1) was assessed using both types of radiographs. Identification of ethnicity was made according to demographic information present in the patients' dental records. The subject population ranged in age from 14 to 24 years. Radiographs were scored according to stage of third molar development using the eight-grade scheme developed by Demirjian (stages A through H, with H representing complete root formation). Every interpretable third molar was scored, and mean and median ages for each developmental stage were calculated. Results were analyzed to determine intraand interarch synchrony, and gender differences. Also evaluated for each stage was the relative probability of whether an individual was 18 years old or older (i.e., in most legal jurisdictions an adult).

Within the age group studied only third molar developmental stages D through H were represented. When both teeth were present and interpretable, left and right third maxillary molars were at synchronous stages in 90.9% of cases, and mandibular third molars in 95.3% of cases. In this African American population, maxillary third molar development was slightly advanced over mandibular third molar development (16.1% as compared with 11.4%, with the remainder synchronous.) This finding was in accord with results determined in previously studied Caucasian and Hispanic populations. However, in contrast to the other populations, third molar root formation occurred earlier in females than males. Standard deviations for chronological age at each formation stage ranged from 0.92 to 2.51 years. Analysis of data to determine the empirical likelihood that an individual is at least 18 years old indicated that an African American male with fully developed third molars (stage H) is with approximately 80% probability 18 years old or older, and a corresponding female has attained this age in approximately 90% of cases.

As with studies of other populations, determination of chronological age of African Americans by assessing third molar development radiographically seems to be an inaccurate exercise with a range of variability within the different developmental stages of approximately 2 to 5 years. On the other hand, it appears that if an African American has fully developed third molars, one might assume with 80 to 90% probability that he or she has attained an age of 18 years. This finding is in accord with a prior study of North American Caucasians, but contrasts with corresponding studies that indicate significantly earlier third molar development among American subjects of Hispanic origin.

Age Determination, African Americans, Third Molar Development

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