

A107 New Methods for Forensic Age Estimation Based on Dental Development

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Learning Overview: After attending this presentation, attendees will understand the role of population variation in dental development and its impact on age estimation.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting data on a large set of radiographs exploring dental development in a diverse group within the United States. This research examines the role of various biological parameters on dental development and presents new methods for age estimation in a forensic context in the United States.

Dental development is considered the most accurate method of age estimation in subadults because this process is less subject to external and internal influences than skeletal development. However, research has suggested that dental development can be affected by secular change, sex, and ancestry.¹⁻⁶ Therefore, it is problematic that the established methods for subadult dental age estimation in the United States do not accurately represent the population to which they are applied. This project proposes new methods for age estimation based on a large, modern sample of United States children representing various ancestry groups.

Using the scoring system developed by Demirjian et al., dental development was evaluated from 1,757 orthopantomograms of individuals ages 5–20 years taken between 1972 and 2017.⁷ Orthopantomograms were obtained from three sources: the James K. Economides Orthodontics Case File System from the Maxwell Museum of Anthropology at the University of New Mexico; the School of Dentistry at the University of Texas Health Science Center at San Antonio; and the Oregon Health Sciences University School of Dentistry. Age estimation methods that did and did not account for sex and/or ancestry differences were created from a training subset of the total sample. Confidence Intervals (CIs) were created for each developmental score for every tooth in the training sample. Additionally, linear models were created to estimate age from multiple teeth.

Overall, dental development among females is advanced compared to males, except in the third molar. Results also indicate that Hispanic individuals tend to develop teeth more quickly when compared to European Americans. However, CIs based on all individuals are comparably accurate to, and more precise than, CIs based on group-specific subsets (i.e., CIs divided by sex and ancestry). Further, linear models based on all individuals also exhibit comparable accuracy and precision to those based on subsets divided by sex and ancestry. The group-specific models with the highest performance measures, those based on females, males, European Americans, and Hispanics, are slightly more accurate and precise than models based on all individuals and are therefore recommended when these parameters are known.

The methods presented here fill a void in the field, as this work represents the only current age estimation method using dental development derived from a modern American population. Results suggest that general methods can be used without losing precision and accuracy, which is helpful in a forensic context as it can be difficult to estimate sex and ancestry from juvenile skeletal remains.

Reference(s):

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Age Estimation, Dental Development, Population Variation