A12 Accuracy of Dental Age in Non-Adults: A Comparison of Two Methods for Age Estimation Using Radiographs of Developing Teeth

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After attending this presentation, attendees will better understand the principles of estimating age in non-adults, current methods that utilize radiographs for age estimation, and their application to the forensic and legal communities.

This presentation will impact the forensic science community by expanding knowledge of the current methods for estimating age in non-adults using dental radiographs by providing a comparison of two dental age estimation methods outlined in Cameriere et al. and AlQahtani et al.[1,2]

Estimating age at death of an individual is an important factor within several scientific fields, with direct application to forensic, archaeological, and legal settings. The goal of this presentation is to provide an assessment of the accuracy and applicability of two recently published methods for age estimation in non-adults, Cameriere's European formula for age estimation and AlQahtani's London Atlas on a multi-ethnic American population.[1,2] These two methods are of particular interest because initial research demonstrates that these methods may produce a more accurate and precise age estimate than the methods currently used in the field of forensic anthropology.[3]

This study utilized dental radiographs drawn from the Maxwell Museum of Anthropology's Orthodontics Case File System at the University of New Mexico. The sample consisted of 363 panoramic radiographs from individuals aged 7 years to 17 years old (mean age=11.9 years) with each individual having been identified as having affiliation with one of the following ethnicities: American Indian, Hispanic, or White/European American. A Dental Age (DA) estimation was performed for every radiograph twice, once using the method outlined by Cameriere and once using the London Atlas. The Chronological Age (CA) of each individual is calculated as the difference between the date of birth provided in the dental record and the date on which the radiograph was taken. For each method, accuracy and bias were determined. The accuracy of DA estimation is defined as how closely CA can be predicted. Bias is defined as the mean difference between DA and CA and can be either a positive or negative number and is used to determine if a method overestimates or underestimates an individual's age. Furthermore, categories relating to ethnicity, sex, and age were applied to the assessment of accuracy and bias in order to compare the two methodological approaches.

The age of each individual was calculated as the difference between the date of birth provided in the dental record and the date on which the radiograph was taken. Preliminary statistics demonstrate a significant positive correlation ($p<0.01$) between DA and CA for both the London Atlas ($r=.87$) and Cameriere's ($r=.72$) method.

To test intra-observer reproducibility, a random sample of 40 panoramic radiographs was re-examined after an interval of two weeks and tested using Pearson's correlation coefficient. Results indicate that there were no statistically significant intra-observer differences between the paired sets of measurements carried out on the re-examined panoramic radiographs for either method.

Estimated age was closer to CA using the London Atlas than Cameriere's method. The London Atlas underestimated age by approximately 0.12 years (Standard Deviation (SD)=2.3) for males and 0.21 years (SD=2.8) for females. Cameriere's method underestimated CA by approximately 1.43 years (SD=1.64) for males, 1.76 years (SD=1.64) for females. In regard to true age, the mean CA was 11.99 years for girls, with Cameriere's method producing a mean DA of 10.23 years and the London Atlas producing a mean DA of 11.76. For boys, the mean CA was 11.95 years with the mean DA being 10.40 years for Cameriere's method and 10.23 years for the London Atlas. Both methods underestimated CA for both sexes. Furthermore, in regard to Cameriere's method, it is suggested that a new regression formula specific to an American population should be created.

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Age Estimation, Non-Adult, Dental Radiograph

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