F33 Age Estimation Standards for a Subadult Western Australian Population Using the Moorrees Method

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After atttending this presentation, attendees will understand the principles and application of the age estimation method developed by Moorrees *et al.* utilizing the dentition of a subadult population.

This presentation will impact the forensic science community by describing the process of formulating age estimation standards specifically for a Western Australian population based on the Moorrees method. As a result of increasing global population mobility, contemporary age estimation standards are required and this study contributes to the body of information in this regard. This relatively uncomplicated method facilitates accurate chronological age estimation in subadults.

It is envisioned that, following this presentation, attendees will understand the principles and application of the age estimation method developed by Moorrees et al. utilizing the dentition of a subadult population.[1, 2] The Moorrees method is a non-invasive and simple approach and is the only standard to include data for both deciduous and permanent teeth from the same series of children.

Age estimation is a vital element of forensic dentistry and is an integral aspect of creating a biological profile. The dentition is widely considered the most reliable indicator of chronological age in subadults because tooth formation shows less variation due to nutritional and environmental factors compared to tooth emergence and skeletal growth. Radiological visualization of dental developmental can thus aid in the accurate estimation of chronological age in forensic and archaeological cases. The visual atlas method of age estimation utilizes dental radiographs that show the distinct stages of tooth development, eruption, and exfoliation. The standards of Moorrees et al. are well-established methods of age estimation that use composite visual images of the developmental stages of individual teeth for each sex.[1,2] For the estimation of age in subadult individuals, it is the method recommended by the American Society of Forensic Odontology (ASFO); however, it is based on the analysis of a North American population, and when applied to foreign populations, a loss of accuracy ensues. With increasing global migration, the most practical solution is to formulate contemporary population specific standards. Recently, a visual atlas was created using the Moorrees standards based on the analysis of dental radiographs from London.[3] Such population-specific charts can lead to increased accuracy of chronological age estimations; however, the London atlas does not provide statistically quantified error rates for age estimations made using the diagrammatic representations.

The present study applies the Moorrees standards to a contemporary Western Australian population.[1,2] The goal is to quantify dental maturation patterns in that population and create developmental standards for potential forensic application. A total of 380 digital orthopantomograms (185 female and 195 male) were analyzed; the stated age range was 4.0 to 25.0 years. In each orthopantograph (OPG) the degree of development and eruption of the permanent teeth, and root resorption in the deciduous teeth, were assigned a numeric score to create a visual atlas (35 illustrations) encompassing individuals between 4-25 years of age. Dental development stages of the permanent teeth were regressed against chronological age; the Standard Error of Estimate (SEE) for the models based on individual teeth ranged from ±1.124 years (right maxillary first premolar) to ±2.197 years (right mandibular third molar) for the pooled sample. Multiple regression models improved prediction accuracy; the most accurate model (SEE of ±1.092 years) incorporates all right maxillary and mandibular teeth (excluding third molars). The accuracy of all age estimation models was tested on a cross-validation sample of 50 OPGs.

The level of accuracy achieved in the present study is comparable to methods using skeletal markers, such as the ossification status of the medial clavicle epiphysis (SD ± 0.26 years to ± 4.21 years) and the radiographic examination of the hand (Greulich-Pyle method SD 0.6-1.1 years; Thiemann-Nitz method SD 0.2-1.2 years).[4,5] This study represents the first-ever investigation of this method in a Western Australian population; the accuracy and relative simplicity of the method confirms its forensic applicability.

References:

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Age Estimation, Dental Development, Subadult

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