F33 Developing Age Estimation Standards for a Western Australian Population Using the Coronal Pulp Cavity Index

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After attending this presentation, attendees will understand the principles and application of the coronal pulp cavity index method for age estimation. This is a non-invasive and simple age estimation method based on secondary dentin deposition. It has significant forensic applications because this method can be applied in living individuals who do not have the appropriate proof of age documentation.

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

Age estimation is an integral aspect of forensic odontology and a crucial element toward establishing the positive identification of living individuals and skeletal remains. In modern multicultural societies where legal and illegal immigration is rising, an increasing demand exists for age estimation in living persons who have no documentation for proof of identity. Age estimation methods, such as aspartic acid racemisation and cementum apposition, require sophisticated laboratory techniques and are time consuming. Furthermore, these methods analyze extracted teeth and, hence, are unsuitable for application in living individuals and/or situations where extractions are not possible for religious and cultural reasons. Simple, non-invasive, and accurate methods are therefore required for age estimation in adults to develop population-specific standards.

Previous research has verified the association between age and secondary dentin deposition. The subsequent reduction of the coronal pulp cavity and its correlation with chronological age is assessed in a Western Australian population following the method of Drusini et al.[1] A total of 450 digital orthopantomograms (220 female and 230 male) from a Western Australian population were analyzed. The age range was 9 to 60 years with a mean age of 28.33 years for females and 27.71 years for males. The crown height (CH) and coronal pulp cavity height (CPCH) was measured in mandibular premolars and molars (excluding third molars) using the in-built visualization software. The tooth coronal index (TCI) was calculated using the formula TCI=CPCH x 100/CH. Linear regressions were performed by regressing the TCI against chronological age. The standard error of estimate (SEE) for the pooled sample was lowest at ±9.64 years for the mandibular left first and second molars. This was followed by the mandibular left second molar and first molars at ±10.74 and ±10.78 years respectively. In females and males, the SEE was lowest for mandibular left molars at ±9.54 years and ±9.74 years respectively. The SEE values obtained by Drusini et al. for their pooled sample ranged between ±5.88 years for the right side molars, to ±6.66 years for the left side premolars.[1] Although the SEE values in this study are considerably higher than those obtained by Drusini et al., these standards will be useful in classifying a Western Australian individual within adult age groups (i.e., young, middle, and older adult).[1]

The level of accuracy achieved using the coronal pulp cavity index is higher as compared to methods using skeletal markers, such as the sternal extremity of the fourth rib (SD=14.93 years in an American population) and the pubic symphysis (SD= 12.4 and 12.2 years for females and males respectively in Phase VI).[2,3] This study represents the first ever investigation of this method in a Western Australian population and the results indicate the method is suitable for forensic application.

References:

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