



F36 Third Molar Development: Comparison of Nine Tooth Development Scoring and Measuring Techniques

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After attending this presentation, attendees will be informed on which tooth development scoring or measuring technique is most promising to use as tool for age estimation

This presentation will impact the forensic science community by explaining the influence of the amount of stages in a tooth developmental scoring technique on age predictions.

Forensic dental age estimation, particularly applied to advice about the age of unaccompanied young asylum seekers, is most commonly based on methods using third molar development. The degree of third molar development is classified using diverse tooth development scoring techniques and a measuring method. The scoring techniques consider observed anatomical tooth parts and (or) make predictions of crown or root lengths to establish diverse developmental stages. The measuring method developed by Cameriere measures the inner side of open tooth apices and normalizes them by the corresponding tooth length. The goal of this study is to compare nine different tooth development classification techniques and to explore which technique is most promising to use as tool for age estimation.

Each accessible third molar on 1,199 panoramic radiographs of 591 female and 608 male individuals from the North Indian population with known chronological age between 4 and 33 years, was scored or measured following nine different tooth development classification techniques described by following authors: Gleiser and Hunt (GH), Haavikko (HA), Demirjian (DE), Raungpaka (RA), Gustafson & Koch (GK), Harris & Nortje (HN), Kullman (KU), Moorrees (MO), Cameriere (CA). Therefore the images were imported in a graphics editing software program. This allowed to perform the CA measurements digitally and in case of doubt between two adjacent scoring stages lengths of the concerned third molar and its preceding second molar were compared.

Spearman correlations were used to detect associations amongst the scoring and measuring techniques and between each technique and age. Regression models with age as response and the scores or measurements as predictor were developed separately for each of the nine classification techniques. The CA score is entered as a continuous predictor. To allow for a nonlinear relation, for this measuring technique restricted cubic splines were used on the log-transformed score. From each obtained model the proportion of variance in age explained by the scoring system (R-square) was calculated. Root mean squared errors (RMSE), reflecting the mean absolute error made in age prediction, were reported.

Additionally, a test sample of 239 panoramic radiographs of 131 female and 108 male subjects with age between 16 and 23 year was collected from the same population for validation of the two most to age

High Spearman correlation coefficients amongst the tooth development classification techniques (between 0.90 and 0.99) and between the different techniques and age (between 0.65 and 0.70) were determined, except for the relations with CA. The tooth development scoring techniques based on an equal or a similar amount of stages are not best related to each other. The R^2 values varied between 0.38 and 1.51 the RMSE between 3.4 and 3.9 year. All results were found similar with best performances detected for MO and GH, worst for CA. The validation of MO, GH, and CA resulted in RMSE reflecting less optimistic mean absolute error in age prediction (respectively 3.56, 3.57 and 4.04 years).

Choosing a tooth development scoring technique with a higher amount of stages is not inherently providing better age predictions. The CA measuring technique performs less than all studied scoring techniques.

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