G9 Third Molar Age Estimation: Appropriately Censoring Stage "H" Using the Data From Two Previously Published Studies — Blankenship et al. and Kasper et al.

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After attending this presentation, attendees will better understand what censoring of stage "H" in dental age estimation is and why it is recommended.

This presentation will impact the forensic science community by demonstrating the significance and improved accuracy associated with the utilization of appropriately censored stage "H" in third molar age estimation cases.

Introduction: The human third molar is the last tooth to undergo morphological development and normally reaches full maturation at late adolescence/early adulthood. Mincer et al. first reported statistical data that permitted age estimation using the third molar and the empirical probability that an individual had attained the age of 18 years.[1] Many subsequent studies have been performed using these data for age estimation of ancestral populations. These studies have been utilized globally to assist authorities with cases regarding immigration and legal age within civil and criminal justice systems.

All third molar studies use a staging system to assess the degree of tooth morphological development. For each defined stage, the mean age of attainment and associated measure of variability (standard deviation) were calculated using normal distribution curves; however, the final developmental stage presents unique challenges because it involves terminal tooth maturation. By convention, previous studies arbitrarily selected the upper limit of the population data set, which resulted in over-estimation of the mean age of terminal tooth development. To accurately access the mean age of attainment of final maturation for the third molar, raw data need to be appropriately censored. Appropriate censoring is defined as the calculated elimination of raw data from individuals beyond the age from which it can be determined that complete maturation has occurred in *all* individuals within the population being studied.

This study utilized data reported by Lewis and Senn, which were recalculated from data reported by two previous studies (Kasper et al. and Blankenship et al.), and subjected these data to appropriate censoring of Stage "H" to calculate mean estimated age, standard deviation, and empirical probability that the individual had attained 18 years of age.[2-4] Each of these studies utilized the staging system developed by Demirjian et al.[5] The raw data in each study were appropriately censored by eliminating data for those individuals exceeding the true chronological age of the mean value for Stage "G" plus three standard deviations. This value was defined as the upper limit for chronological age of individuals included in the calculation of Stage "H," which effectively eliminated only 0.1% of the population who were still undergoing third molar development. This method produced a more accurate estimation of age at attainment of Stage "H." This study improved age assessment based on the developmental stage of the third molar.

Reference(s):

1. Mincer H.H., Harris E.F., Berryman H.E. The A.B.F.O. study of the third molar development and its use as an estimator of chronological age. *J Forensic Sci.* 1993. 38(2): 379-90.
2. Kasper K.A., Austin D., Kvanli A.H., Rios T.R., Senn D.R. Reliability of third molar development for age estimation in a Texas Hispanic population: A comparison study. *J Forensic Sci.* 2009. 54(3): 651-7.
3. Blankenship J.A., Mincer H.H., Anderson K.M., Woods M.A., Burton E.L. Third molar development in the estimation of chronological age in American blacks as compared with whites. *J Forensic Sci.* 2007. 52(2): 428-33.
4. Lewis J.M., Senn D.R. Dental age estimation utilizing third molar development: A review of principles, methods, and population studies used in the United States. *Forensic Sci Int.* 2010. 201(1-3): 79-83.
5. Demirjian A., Goldstein H., Tanner J.M. A new system of dental age assessment. *Hum Biol*. 1973. 45(2): 211-227.

Forensic Science, Forensic Odontology, Age Estimation

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