H106 Can We Use Dental Wear for Age Estimation of Modern Americans?

Yangseung Jeong, MA, 560 Prestwick Ridge Way, #100, Knoxville, TN 37919; and Eun Jin Woo, Seoul National University, Dept Anthropology, San 56-1, Silim-dong, Kwanak-gu, Seoul, SOUTH KOREA*

After attending this presentation, attendees will understand that dental wear is a biased aging indicator in the modern American population; therefore, aging methods based on dental wear can hardly be applied in a forensic context.

This presentation will impact the forensic science community by providing empirical evidence through sophisticated statistical evaluation stressing the inability of dental wear being used as an accurate aging indicator in modern, contemporary Americans.

Contrary to the popularity of using dental wear as an aging indicator in archaeological materials, contemporary forensic communities have had very few publications regarding this subject. Furthermore, no research was found that specifically used the examination of dental wear as an independent aging indicator for modern populations. The goal of this study is to evaluate the accuracy versus inaccuracy of dental wear as an aging indicator in modern American populations and, therefore, provide forensic anthropologists with a theoretical basis for the use or disuse of dental wear when constructing biological profiles for human remains.

As a pilot study, the dentition of 73 modern White male skeletons in William M. Bass donated collection at the University of Tennessee, Knoxville were examined. The age of the samples is normally distributed with the mean of 52.71 (SD=13.03) and the range of 25 to 78 (Kolmogorov-Smirnov test, $D(73)$=.066, p>0.05). Dental wear was assessed according to the eight criteria of Smith, with the exception of the third molars, and average scores were calculated for each tooth group (i.e., incisor, canine, premolar, and molar).[1] For statistical evaluation, a total of ten statistical analyses were performed: four simple regressions of the score of each tooth group on actual age; one multiple regression of the scores of four tooth groups on actual age; four logistic regressions of the score of each tooth group on age categories; and one logistic regression of the scores of four tooth groups on age categories. Age categories were defined following Hrdlička, by which samples were assigned into one of the four age groups of 26-34, 35-50, 51-64, and 64+ years.[2] The appropriateness of dental wear as an aging indicator was assessed based on the Pearson's correlation coefficient (r), R^2 and Nagelkerke's R^2_N.

In the results of simple and multiple regression analyses, the highest r and R^2 were 0.405 and 0.164, respectively, when all tooth groups were regressed on actual age. Since the adjusted R^2 in this model was as low as 0.06, it could be concluded that some unnecessary predictors exaggerated R^2; therefore, this regression model cannot be generalized. In the results of logistic regression analyses, the highest Nagelkerke's R^2_N was 0.25 which was obtained when only incisors were included in the model. Scatter plots revealed that this low relationship between dental wear and age was due to slight dental wearing in older samples rather than severe dental wearing in younger samples.

Obviously, any values of r, R^2, and Nagelkerke's R^2_N in this study did not satisfy the standard (r>0.9 or r>0.7) to yield an accurate assessment recommended by Bocquet-Appel and Masset and Lovejoy *et al.*[3,4] Moreover, considering that the r values of this study are lower than other studies regarding popular aging indicators such as pubic symphysis, auricular surface, and the 4th rib end, using dental wear as an independent aging indicator can hardly be justified.

Despite any possible limitations due to incorporating only White, male samples in this research, results of the statistical evaluation have revealed the inability to use dental wear as an accurate age indicator for modern contemporary Americans. Therefore, this research has a two-fold practical significance. It stresses that the use of skeletal features (i.e., dental wear) can be context-dependent (e.g., archaeological versus forensic context) and also provides empirical evidence to caution, if not discourage, forensic anthropologists when using dental wear to estimate the age of human remains.

References:

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4. Lovejoy CO, Meindl RS, Mensforth RP, Barton TJ. Multifactorial age determination of skeletal age-at-death: a method and blind tests of its accuracy. Am J Phys Anthropol 1985;68:1-14.

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 ** Presenting Author*