G2 Measuring Root Transparency for Age-at-Death Estimation: What About the Light?

Joe Adserias Garriga, DDS, PhD, c/ Balmes 62 30 la, Barcelona, SPAIN; Laia Nogue Navarro, UdG, C/ Emili Grahit 77, Girona, SPAIN; Sara C. Zapico, PhD, FL International University, Dept of Chem and Biochem, Modesto A. Maidique Campus, OE116, 11200 SW 8 Street, Miami, FL 33199; and Douglas H. Ubelaker, PhD, Smithsonian Institution, Dept of Anthropology, NMNH, MRC 112, Washington, DC 20560*

After attending this presentation, attendees will acquire a deeper understanding of how to apply root transparency measurements when implementing age-at-death estimation methods.

This presentation will impact the forensic science community by describing the illumination conditions required for measuring root transparency to achieve an accurate age-at-death estimation.

Age-at-death estimation is one of the main goals in forensic identification since age estimation significantly narrows the search possibilities in cases involving missing persons and unidentified bodies. Moreover, age segregation in cases of mass disaster and multiple victims' situations can be of great help in the process of identification. The study of dental tissues has long been considered a proper tool for age estimation; therefore, several age estimation methods involving dental studies have been developed and widely used. Dental age estimation methods can be divided into three criteria: tooth formation and development, post-formation changes, and histological changes. Tooth formation and growth changes are applied for fetal and infant age estimation; however, at the end of dental and skeletal growth, methods addressing post-formation or biochemical changes should be applied. Lamendin et al. developed an adult age estimation method based on root transparency and periodontal recession.[1] The regression formula demonstrated its accuracy for age estimation on individuals between 40 and 70 years of age. Later, Prince and Ubelaker evaluated the effects of ancestry and sex, and incorporated root height into the equation, developing four new regression formulas for males and females of African ancestry and males and females of Caucasian ancestry.[2] Even though root transparency is a key element in the method, the conditions for measuring this element have not yet been established. The goal of the present study is to describe the illumination conditions measured in lumens that result in increased accuracy when applying the Lamendin et al method as modified by Prince and Ubelaker.[2]

Fifty-five single-rooted teeth clinically extracted from known age and sex individuals (19 upper incisors, 11 males and 9 females; 36 upper and lower canines, 19 males and 17 females) were used for this study. Two observers measured root height, periodontosis, and root transparency by caliper from the labial surface, and recorded the measurement in milimeters. Root transparency was measured applying three different lights: 6,500lux, 3,000lux, and 1,600lux. All measurements were repeated on two different days. After taking the measurements, Lamendin and Prince and Ubelaker formulas (modified from Lamendin's method) were employed to estimate the age of the individual. Comparison with actual age was conducted by statistical analysis. There were no significant differences found between age estimation using 1,600lux illumination and the actual age (p=0.872). In contrast, age estimates using the other illumination levels revealed significant differences with respect to the actual age ($p < 0.05$).

Although previous studies analyzed the use of Lamendin parameters involving creation of new formulas for age-at-death estimation based on population differences (Prince & Ubelaker, 2000; Ubelaker and Parra, 2008; González- Colmenares et al. 2007), none of these studies or other studies focused on setting up the correct conditions for the measurement of root transparency.[1-4] As a result, the present work is the first one recorded in the literature to address this issue. This study depicts how illumination conditions may affect root transparency measurement and, therefore, the age estimation methods that rely on this postformation change. These results pointed out that light conditions must be taken into account for correct determination of this parameter. Therefore, this is a pioneer project in this area, which hopefully promotes further studies regarding correct conditions for age-at-death estimation.

Reference(s):

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3. Ubelaker D.H., Parra R.C. (2008) Application of three dental methods of adult age estimation from intact single rooted teeth to a Peruvian sample. *J Forensic Sci.* 53:608–611.
4. Gonzalez-Colmenares G., Botella-Lopez M.C., Moreno-Rueda G., Cardenete J.F. (2007) Age estimation by a dental method: A comparison of Lamendin's and Prince & Ubelaker's technique. *J Forensic Sci.* 52:1156–1160.

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*Presenting Author