



Physical Anthropology Section - 2013

H67 Using Tooth Cementum Annulation for Age Estimation in Forensic Casework

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After attending this presentation, attendees will understand the basic premises behind age estimation using Tooth Cementum Annulations (TCA) and the current theoretical and methodological issues relevant to its application in forensic practice. The role of TCA, as an age estimator, in the analysis of two forensic skeletal cases will be discussed, including the methods used, documentation procedures, and analytical results.

This presentation will impact the forensic community by outlining the practical use of TCA in casework and make recommendations as to when it is appropriate to use as an age estimator. Further discussion as to how the results of TCA analysis should be conveyed to law enforcement is also suggested, using the case studies as examples.

Cementum is a dental hard tissue that anchors the teeth into their sockets via the periodontal ligament. Once a tooth has erupted, two bands of cementum are laid down per year of life, although the phenomenon has been observed in unerupted teeth as well. Under magnification with transmitted light, the bands alternate light and dark in color, with each pair of bands representing one year.

The phenomenon of cementum increments is well documented in some non-human populations and does appear to show sensitivity to life history variables like birth, trauma, and nutrition. Although why cementum increments are initiated into production and their apparent circadian rhythm remains somewhat speculative, especially in humans, cementum annulation has been proposed as a forensic aging method. There are many fundamental questions that are as yet unanswered or theoretical in nature, but cementum annulation is observable and does correlate with age at least as well as other traditional aging methods, making it attractive as another tool in the forensic anthropologist's toolkit.

Case 1 represents a completely skeletonized cranium, mandible, atlas, axis, and hyoid (body only) discovered in a partially decomposed duffel bag with a closed zipper. Based on dental eruption, cranial sutures, and general condition of the limited bones recovered, age was estimated to be "adult," approximately 25 to 50 years old at the time of death. Case 2 represents a partially skeletonized female with extensive blunt force trauma to the cranium. The skeleton, originally discovered and analyzed in the early 1990s, was estimated to represent a female of European ancestry, aged 18 to 24 years. During re-evaluation of the case in 2009 for additional leads and the potential for new forensic techniques, it was discovered that the postcranial skeleton, including the mandible, had been cremated; however, the cranium was still in evidence. In each case, a tooth was analyzed for TCA.

The contribution of TCA to each of the cases was very different. In Case 1, TCA as a 'traditional' age indicator, was employed. Given the lack of other specific age indicators, TCA contributed to a narrowing of the original age estimate, from 25 to 50 years to 30 to 40 years old at the time of death.

Case 2 involved a much different role for TCA. Only 2.5 pairs of bands were observed on the tooth. When added to the average age of eruption for the tooth, a much younger age at death than was originally reported was indicated. Taking a holistic approach and integrating all age indicators available, a re-evaluation of the first skeletal analysis was prompted. Although the postcranial skeleton was cremated, excellent documentation and photographs were available so that the raw data on which the first biological profile was based was sufficient to use. During the second analysis, more inclusive, updated standards were employed, as well as a critical approach to the methods used in the first analysis. Ultimately, TCA contributed mostly to prompt an updated look at the case and appraisal of the skeletal indicators, which suggested an age between 14 and 18 years at death.

These cases illustrate the potential use of TCA; however, a realistic appraisal of TCA and the assumptions on which it is based, both proven and unproven, need to be explicitly addressed before TCA is widely used in a forensic setting and to direct future research.

Cementum Annulation, Anthropology, Age-at-Death