

G14 Postmortem Anterior Tooth Loss and Time Since Death

Susan J. Baker, DMD*, Atlanta Laser Periodontics & Dental Implants, Norcross, GA 30092; Murray K. Marks, PhD, University of Tennessee, Knoxville, TN 37920; James M. Lewis, DMD, Madison, AL 35758

Learning Overview: After attending this presentation, attendees will understand the merits and limitations of estimating time since death by human anterior tooth loss in found remains. Knowledge will be gained regarding periodontal ligament during decomposition phases.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by aiding death investigators and forensic odontologists in determining the significance of missing or retained anterior dentition in found remains and by furthering knowledge of periodontal ligament decomposition.

Materials and Methods: This study examined human periodontium decomposition in 20 dentitions from donated bodies at the National Forensic Academy's rural Cumberland Forest Decomposition Facility near Oak Ridge, TN. Jaws were photographed, radiographed, gingival margin and periodontal probing depths recorded, attachment level calculated, mobility charted, occlusal wear scored, and thin sections prepared for light microscopy.^{1,2} Daily weather conditions and seasonality were recorded.

Results: As expected, placement during warm and wet/humid conditions with average temperatures between 70°F and 95°F and daily rainfall averaging three millimeters (mm) or more daily resulted in greater insect (i.e., blowfly [Calliphoridae]) activity and more rapid gross soft tissue decomposition. Placement during warm and dry conditions with daily rainfall averaging less than 3mm resulted in gross mummification (desiccation) and affixed, stationary soft tissues. Cool and wet conditions with average temperatures between 40°F and 70°F had delayed soft tissue decomposition and postmortem loss. Placement during cool and dry conditions with average daily rainfall less than 3mm delayed decomposition resulting in desiccation. Postmortem tooth loss chronology corresponds with periodontal health during life. Advanced periodontal disease, increased mobility, and alveolar recession recorded at body placement showed accelerated postmortem tooth loss. The loss of the surrounding keratinized gingival tissues and the alveolar crest fibers of the Periodontal Ligament (PDL) contributed to periodontal decomposition and tooth loss. Insect larval activity did not influence subcrestal PDL decomposition as PDL width varies from 0.1mm–0.4mm and first instar blowfly larvae are about 2mm in length and 0.75mm in width.³ An expected delay in tooth loss in individuals with occlusal wear in a healthy dentition was not witnessed. Since a comparative histological study of the healthy and decomposition PDL is lacking, the assumption of past researchers that the periodontal ligament space is “empty” is erroneous. This study demonstrates a long-lasting remnant of the collagenous fibers during various stages of decomposition. In nine subjects, a decrease in mobility of one or more teeth was noted over time. Desiccation of the PDL was thought to aid in mobility decrease and tooth retention.

Conclusion: Length of time since death does not appear to be able to be determined due to anterior tooth loss. Considering area temperatures and humidity levels may aid in narrowing the time frame.

Reference(s):

1. Miller S. *Textbook of Periodontia*. Blakiston Co, Philadelphia (1950), p.91.
2. Smith B.G, Knight J.K. An index for measuring the wear of teeth. *Br Dent J* 1984;156:435-438.
3. Bunchu, N. et al. Morphology and Development Rate of the Blow Fly, *Hemipyrellia ligurriens* (Diptera: Calliphoridae): Forensic Entomology Applications, *J Parasitology Res* 2012;371243.

Time Since Death, Postmortem Tooth Loss, Periodontal Ligament