F2   3D Photography of Bitemarks and Digital Comparison With an Individual's Model

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After attending this presentation, attendees will learn how an existing technology could be applied to forensic odontology and specifically, bitemark analysis.

This presentation will impact the forensic science community by demonstrating an established modality that can be applied to forensic odontology for more accurate photo documentation of human bitemark injuries. Accurate evidence collection is the first step to improved scientific analysis.

Photographs of bitemark injuries in 2D are the standard methodology utilized to document the injury for future analysis. Due to the curved anatomical surfaces on which many bitemarks occur, such as the human arm and breast, photographic distortion can be introduced as a factor complicating the analysis. This distortion, once introduced, is difficult to rectify without potentially creating further image distortions. Utilizing the advanced technology of 3D photogrammetry systems, this photographic distortion can be eliminated, leading to higher accuracy at the data collection stage.

3dMd is a high-precision 3D surface imaging system with current applications for both living and non-living subjects. The use of the 3dMd system and its precision and accuracy has been established in the scientific literature in sources such as: the American Journal of Orthodontics & Dentofacial Orthopedics, the International Journal of Oral and Maxillofacial Surgery, Facial Plastic Surgery Clinics of North America, and the Journal of Prosthodontics. The imaging system is currently in use in various fields ranging from anthropology and biometrics to craniofacial and cleft lip and palate treatments. Applying this technology to the capture of the bitemark injury could both improve the documentation of the injury as well as allow for 3D bitemark analyses to be performed.

Utilizing a digital imaging system, a digital model of an individual's dentition can be produced in Stereo Lithography (STL) format. STL is a file format native to the stereo lithography CAD software created by 3D systems. STL files describe the surface geometry of a 3D object such as an individual's dentition without any representation of color or texture. Current applications in the field of orthodontics allows STL files generated from cone beam computed tomography of a patient's craniofacial system to be "mapped" to the 3D photograph of the subject's face, allowing for comparison of hard and soft tissues without distortion or magnification.

Applying this same concept, the STL of an individual's dentition could be "mapped" to the 3D surface characteristics captured in the 3dMd photograph of the bitemark. In this manner, a 3D bitemark analysis protocol could be developed. This new protocol would improve upon the current industry standard 2D analysis by minimizing or eliminating photographic distortion.

The digital model technology and STL file capabilities exist today in an applied format; however. the 3D photogrammetry technology must advance to a more portable format in order to have a practical forensic application. This does not preclude the importance of studying the technology's application to forensic odontology and beginning a scientific endeavor to apply this technology.

Forensic Odontology, Bitemark Analysis, 3D Photogrammetry