



G30 Assessing the Reliability of Measurements of Human Dental Casts Using an Intraoral 3D Scanner

Mithun Rajshekar, MFSc*, 2/67 Olinda Grove, Mt Nelson, Hobart, Tasmania 7007, AUSTRALIA

After attending this presentation, attendees will better understand using technological advances such as an intraoral 3D scanner in forensic investigations of bitemarks.

This presentation will impact the forensic science community by providing analytic results of a study in which measurements of dental landmark features that were made using hand-held intraoral 3D scanners are validated for their reliability and repeatability against measurements that were made using a conventional hand-held digital caliper. This study establishes the hand-held intraoral 3D scanner as a reliable tool that can be used to measure landmark dental measurements to be applied in the forensic analysis of dental evidence.

Background: Dental casts have been used to study dental anatomy and surrounding structures for research and therapeutic purposes, but their preparation is time-consuming and the procedure causes discomfort to subjects. In the forensic investigation of confirmed bitemarks, dental casts are compared to bitemarks found on victims. The materials currently used to make dental casts undergo structural and chemical changes while setting; consequently, the casts may not be completely accurate. Intraoral 3D scanning of dentition has the potential to provide a fast, accurate, and non-invasive method of recording dental information.

Goal: The goal of this study was to assess the reliability of measurements of human dental casts obtained with a portable intraoral 3D scanner that was appropriate for field use in forensic investigations.

Methods: Two raters each measured 84 tooth and 28 arch features of 50 sets of upper and lower dental casts. The first measurements used digital hand-held calipers, whereas the second measurements used the 3D measuring software provided with the Zfx IntraScan Intraoral 3D scanner to obtain 3D images of the digital dental casts. The measurements were repeated at least one week later. Reliability was quantified by comparison of means for test-retest, rater-rater, and method-method differences, regression of differences on covariates for factors influencing measurement error, and calculation of Intra-Class Correlation Coefficients (ICC) and Standard Errors of Measurement (SEM).

Results: The differences in the two measurements were small and did not vary with characteristics of the casts. Intra-rater ICC (3, 1) and SEM were 0.99 (95% CI, 0.98-0.99) and 0.0612, respectively, for the intra-oral 3D scanner, and 0.99 (95% CI, 0.99-1.00) and 0.0127 for the digital hand-held caliper, respectively.

Conclusion: The intra-oral 3D scanner provides measurements of features of human dental casts that are reliable and have comparable reliability to those made by conventional digital hand-held calipers. A future direction of this research is to confirm the reliability of measurements of non-human dentition.

Bitemark Analysis, Dental Evidence, Forensic Odontology