F34 A Comparative Reliability Analysis of Computer-Generated Bite Mark Overlays

Anne H. McNamee, DDS, MSc, Bureau of Legal Dentistry, 361 Hilltop Drive #332, King of Prussia, PA 19406; David Sweet, DMD, PhD, Bureau of Legal Dentistry, University of British Columbia, 146-2335 East Mall, Vancouver, BC V6T 1Z4, Canada; Iain A. Pretty, BDS, MSc, University of Liverpool, Department of Clinical Dental Sciences, Edwards Building, Daulby Street, Liverpool L69 3GN, England*

The educational goals of this presentation are to present research results from a comparative analysis of two different Adobe Photoshop techniques used to create computer-generated bite mark overlays. The techniques evaluated during the study will be illustrated and the assessment of the reliability analysis will be explained.

This presentation will impact the forensic community and/or humanity by helping to satisfy the judicial requirements for the admissibility of bite mark evidence.

Courts have recently taken an aggressive approach toward the scientific foundation of expert testimony. The validity and reliability of scientific techniques used in the courtroom have brought many previously accepted methods of forensic investigation under closer inspection. Significant cases such as *Daubert* and *Kumho* have demonstrated that scientific evidence must meet a minimum level of judicial scrutiny before testimony is accepted.

This study compared the reliability of two different methods to produce computer-generated bite mark overlays. Two key elements assessed during the study were: 1) How often one examiner could produce an overlay that was similar to that produced by another examiner, and 2) How consistent the repetition of overlays produced could be achieved using the two different techniques.

While researchers have examined individualized methods for generating computerized bite mark overlays, no study had yet to directly compare two different methods. This study focused on the production of overlays by using two techniques: a) Adobe Photoshop Magic Wand Tool, and b) Adobe Photoshop Inversion Tool. These are two popular techniques used in North America (Sweet and Bowers) and Europe (Naru and Dykes).

Scanned images of twelve dental casts were sent to thirty examiners. Examiners were divided into three research groups based on their forensic odontology experience level. These groups included Diplomates of the American Board of Forensic Odontology with extensive bite mark experience, forensic dentists with limited bite mark experience, and second-year dental students at the University of British Columbia with no bite mark experience. Examiners were instructed to produce an overlay for each cast image based on the instructions provided for the two techniques.

After the overlays were submitted, measurements of the area of the biting edge and the x-y coordinate position of each of the six upper and six lower anterior teeth were obtained using Scion Image® software program. The interand intra-reliability assessment of the measurements was performed using an analysis of variance and calculation of reliability coefficients. Of significant interest were the differences seen between the research groups and the individual variations amongst the casts selected.

The analysis of variance results showed that the forensic experience level of the examiner and the cast variations contribute significantly to the variances seen in the area for both techniques. The interand intraexaminer reliability coefficients are low. The results for the positional measurements showed that the forensic experience level of the examiner contributes no significant differences to the variances. The differences are seen within the cast variations. The interand intra-examiner reliability coefficients are exceptionally high. It was concluded that both techniques were reliable methods to produce bite mark overlays in assessing tooth position.

Bite Marks, Computer Overlays, Reliability

 ** Presenting Author*