F7 The Role of the Skin in Bite Marks, Part II: Macroscopic Analysis

Raymond G. Miller, DDS, 122 Covington Road, Buffalo, NY 14216; Peter J. Bush, BS, Laboratory for Forensic Odontology Research, School of Dental Medicine, State University of New York at Buffalo, B1 Squire Hall, South Campus, Buffalo, NY 14214; Robert Dorion, DDS, 1 Place Ville-Marie, Ste 11238, Montreal, QE H3B 3Y1, CANADA; and Mary A. Bush, DDS, SUNY at Buffalo, B1 Squire hall, 3435 Main Street, Buffalo, NY 14214*

The goal of this presentation is to evaluate to what level the human dentition can be considered unique once it is impressed in the skin. Attendees will appreciate how skin can alter tooth size, inter canine distance, and rotation of the teeth.

This presentation will impact the forensic community by demonstrating if dentitions, which were measured and determined to be unique, can still be considered unique once impressed in the skin.

One of the issues today in forensic odontology is the question regarding the uniqueness of the human dentition. Many studies have been performed to address this issue utilizing various means of sophisticated evaluation, such as 3D scanning, and geometric morphometric analysis. However, most studies measure the model itself without reference to any bitten substrate. Studies that do make a comparison to a bitten substrate have used wax or plaster, both of which behave quite differently from skin. Hence, this study incorporated the measurement of models with assessment of those measurements to the resultant bite in human skin.

Skin, with its varying biomechanical properties, creates a situation that is less than ideal to accurately record the dentition. It is indisputable that a degree of discrepancy will result between the actual measurements of a model and what is registered in the skin. The resultant distortion poses the question: To what degree of certainty can we recognize uniqueness based on the dentitions appearance in the skin?

Human Subject Review Board (HSRB) exemption was applied for and granted for this project. Three hundred and thirty four polyvinylsiloxane (PVS) impressions were randomly collected at the State University at New York School of Dental Medicine. These impressions were from the patient pool at the dental school clinic, and since this was a random collection, age, sex, and race were unknown to the authors of this study. Of these impressions, one hundred lower impressions were selected for this study. The criteria for inclusion were an impression that satisfactorily recorded the anterior dentition and that the dentition had a full complement of teeth from canine to canine (#22-27). The same upper arch was used for all of the models and served as a constant, the lower being the variable. This allowed for evaluation of distortion between bites.

All one hundred of the lower models were poured under vacuum in jadestone, and scanned into a flatbed scanner (Hewlett Packard 6100/CT) at 300dpi. Hollow volume overlays were constructed and metric/angular analysis performed with Adobe Photoshop (Johansen and Bowers method). Mesial to distal width, angle of rotation, and inter-canine arch distance was measured and recorded for teeth #22-27. Mal-alignment patterns were evaluated and assessed. Frequency of occurrence was noted. The models were then grouped according to their mal-alignment patterns.

The biters represented models from each of the mal-alignment groups. These models were articulated and mounted onto hand held vice grips. Bites were inflicted on un-embalmed cadavers. The cadavers were stored at 4 °C and had no apparent tissue breakdown. After the bites were made, care was taken to photograph the wounds in the same position they occurred.

The resultant bites were photographed with a Canon Rebel XTi 10.1 MP digital camera and entered into Adobe Photoshop. An ABFO ruler was in place for all of the photographs. Metric and angular analysis was performed (Johansen and Bowers method).

The bites were then compared to the measurements acquired from the models in each test group. Deviation in the skin was compared to actual dimensions of the models. This discrepancy is described and assessed.

Bite mark evidence has come under scrutiny in the judicial system. It is therefore important to conduct scientific studies that address unknown answers in bite mark analysis. It is not so much a question of the uniqueness of the dentition but rather does that dentition retain its uniqueness once transferred to the skin. In order for bite mark analysis to maintain validity in a court of law issues such as this must be investigated.

Bite Marks, Skin, Uniqueness of Dentition

 ** Presenting Author*