F29 Transfer of Dental Patterns to Human Skin

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After attending this presentation, attendees will: (1) understand how tooth characteristics may not be reliably transferred and recorded in the bitten subject; (2) understand that alterations in height and displacement of particular teeth may affect the position of adjacent teeth in the bitten subject; and, (3) be introduced to additional distortion in a bitemark.

This presentation will impact the forensic science community by providing a better understanding of how individual tooth characteristics are recorded in bitten tissue.

Previous studies on human cadaver models have reported significant levels of distortion of bitemarks in skin, and matches among the anterior dentition in open population studies have been found. The goal of this study is to establish a threshold as to what degree of difference in shape of one dentition will be distinguishable from another as reflected in a bitemark in human cadaver skin.

HSIRB exemption was granted for this project. Eight sets of dental casts were produced and divided into two groups. One group varied the affects of height changes in teeth while the other varied tooth displacement affects. In the first group, the lateral incisors were systematically shortened in 1mm increments up to 3mm. In the other group, the lateral incisor and canine were facially/lingually displaced in 1mm increments up to 5mm. Each of the models was scanned on a flatbed scanner for comparison with the bitemarks they produced.

A series of ten repeated bites, distributed over arms and legs of unembalmed cadavers, were inflicted with each model, and digitally photographed with an ABFO #2 scale in place.

Comparison analysis using landmark-based geometric morphometrics indicated that alterations of a limited number of teeth not only introduced additional distortion in the bitemark, but also affected the apparent position of adjacent teeth in the bitemarks. Displacing the lateral incisor and canine resulted in a relative shift in position of the central incisors and unaltered canines, while the shortening of the lateral incisors resulted in a shift in relative position of the central incisors. Moreover, the features of displacement were more pronounced in the inflicted bitemarks than in the dentition used to make the bites, thus the bitemarks tended to exaggerate the differences. Also, the observed distortion was more significant in the mandibular than maxillary arch, suggesting that the mandible expresses higher variation than the maxilla.

Thus, due to shift in relative tooth position and resulting distortion, nearly every bitemark consequently looked unique, and no matches within measurement resolution were found between the bitemarks and the dentition used to inflict them. It was found, however, that a displacement of 5mm between teeth enabled distinction between the dentitions. No such threshold of distinction could be established for the height variation of teeth under the given experimental conditions. In other words, it was not possible to establish a reliable threshold of how different dentitions have to be in order to be distinguishable from one another.

The study was conducted under a controlled situation on cadaver skin with limited variables. In a real biting situation, more variables are involved, such as dynamics of the bite or movement of the victim, which would possibly lead to more distortion of a bitemark than under the controlled conditions of this study. The results of this study indicate that bitemark evidence should be used with caution.

Bitemarks, Bitemark Research, Distortion

 ** Presenting Author*