



JOURNAL of FORENSIC ODONTO- STOMATOLOGY

VOLUME 31 Supplement 1 October 2013
Abstract book IOFOS Conference 2013 Firenze

3D imaging for bite mark analysis – presentation of a new approach

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The authors declare that they have no conflict of interest.

Background: In recent years the forensic analysis of human bite marks has been subject to increased scrutiny and a number of authors have presented case examples where incorrect bite mark evidence at least in part has contributed to wrong convictions. Consequently a paradigm shift in the analysis of bite marks towards a much more cautious and scientifically based approach to the use of bite mark analysis methods has been seen. The need for methods reducing errors when capturing the complex details of curved and often distorted lesions in soft tissues has been emphasized. Preliminary reports on the use of objective, digital and multiple-dimensional methodological approaches are emerging.

Method / Results: Experimental bite marks were scanned with a Creaform GoScan (Creaform, Quebec, Canada) after placing 4 adhesive reference labels adjacent to the bite marks. Scans were taken with and without the ABFO no. 2 scale. The full dentitions of the “suspects” were scanned with a Trios intraoral scanner (3Shape, Copenhagen, Denmark) and digital 3D casts of the dentitions were generated with 3Shape Ortho System software. Datasets of the 3D bite mark scans and the digital casts were combined by a newly developed customized software (Kvejborg, Denmark) allowing digitalized measurements of linear and angular features in the casts and soft tissue scans as well as 3D visualizations of physical fits between casts or segmented casts and 3D bite mark scans in a 1 : 1 scale. The method allows 3D printing of the anatomical site including the bite mark which in certain cases may be useful for the presentation of a crime case. The application of the multidimensional digital approach is exemplified by the presentation of a recent homicide case involving bite marks.

Conclusions: By applying multidimensional digital applications objective data on minute details, in bite marks and in the suspects dentition, can be obtained and compared more objectively than was possible with the formerly used methods which converted multidimensional complex features of bite marks as well as dentition details into 2D overlays for comparative analysis.

KEYWORDS: Forensic Odontology, Bitemark, 3D imaging.