F38 Suggested Use of a Hand-Held Scanning Device to Produce Accurate Evidentiary Measurements in Bitemark Analysis

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After attending this presentation, attendees will learn how the forensic odontologist must be capable of presenting evidentiary accurate measurements and documenting such measurement by photographic and/or digital images. This presentation will explore the use of a hand-held scanning device to facilitate a more accurate means of documenting bitemark evidence.

This presentation will impact the forensic science community by exploring how the utilizing of a hand-held scanner in bitemark analysis is examined.

Previous studies discussed how the forensic odontologist relies on highly accurate measurements to facilitate evidentiary quality bitemark analysis. Reasonably accurate Alginate or the more stable and accurate polyether or polyvinyl siloxane impression materials are capable of producing measurement friendly dental stone study models. All these measurements are usually taken in a flat plane linear environment. For example the inter-canine cusp measurement is accomplished by simply placing the standard ABFO #2 ruler across the model and recording the appropriate dimension. Such data accurately translates to photographs (both film and/or digital) through specialized scanning techniques and photo processing software. The resultant images are generally accepted as evidence in litigation. Analysis of the bitemark is more problematic.

Bitemarks by their very nature are subject to either *in vivo* healing or postmortem decomposition. Elastomeric impressions, methacrylate tissue excision techniques, and specialized 1:1 close-up photographs or digital images all serve to preserve the bitemark as evidence. Measurement problems occur because bitemarks are rarely made in a truly flat plane environment. It is the natural curves of the human body that lends itself to exhibiting a bitemark that has been made around a curved surface. If one should photograph the bitemark with the #2 ruler in view all objects are in a two dimensional posture and all measurements taken of a curved surface with a straight ruler with have some inherent inaccuracies. It was determined that such inaccuracies could be as high as 36.31% if one considered a bitemark on a perfectly round body part. It is the recording of analytical and subsequent evidentiary documentation that this paper will address.

Methodology for this analysis will be based on comparisons of measurements taken from digital photographic images produced by a standard professional close-up camera and lens and a digital image produced by a hand held scanning device with measurements taken in vivo on a test subject.

Several measurable marks were made on a volunteer utilizing a non-permanent marking device. Digital photographs were taken with a single lens reflex digital camera fitted with a 105mm macro lens and close-up strobe lighting apparatus. An ABFO #2 ruler was placed in some of the photographs and a self-adhesive flexible measuring tape was used in other photos. An eight and one-half inch hand-held scanning device was used to obtain similar images. All photographs taken with the digital camera were in color and at a high resolution. The scanner was also set for color scanning at a resolution of 600 DPI (dots per inch). Results showed a comparison of measurement differences and similarities by the various recording modalities. It is noteworthy that under certain circumstances such as a curved flat-plane area the measurements elicited by the scanner and the adhesive tape were more accurate than the camera with the ABFO #2 ruler.

This analysis suggests that measurements along a curved surface should be made by rotating the ABFO #2 ruler along the arc, by using some flexible measuring device, or by using a hand-held scanner.

Measurement, Scanner, Bitemarks

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