



E44 Bitemark Analysis: Foundation, Lessons From the Past, and Paradigm Shift to the Present and the Future

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After attending this presentation, attendees will better understand the scientific methodology of bitemark analysis, the evidentiary strengths of bitemark analysis, the roles of the bitemark analyst and bias, past cases of "bitemark analysis-gone-wrong," comments on the National Academy of Sciences Report, "*Strengthening Forensic Science in the United States: A Path Forward*" (2009), and the evolving future of bitemark analysis.

This presentation will impact the forensic science community by demonstrating the evidentiary value of the appropriate use of bitemark analysis. Despite a recent past that has included innocent persons to lose liberty and freedom as a result of expert testimony involving faulty bitemark analysis, there have been exponentially more cases where the use of bitemark analysis has resulted in protecting individuals and society from violent predators as well as interventions that have saved countless lives.

Bitemark analysis as a scientific investigation meets all the criteria for the definition of *science* with one notable exception, the ability to create and study bitemarks in living human skin. It is not currently possible to experimentally create and study biting patterns in living human skin. All other aspects of the application of scientific methodology in bitemark analysis are valid, accurate, and scientifically sound.

When a bitemark injury is considered to be of high evidentiary quality, the presence of semi-circular opposing arch forms depicting the maxillary and mandibular teeth, each with distinctive markings representing the individual teeth in the associated semi-circular patterns, and a closed population of suspected biters is identified - each with distinctly differing arrangements of teeth - bitemark analysis can be done to reliably identify or exclude given biters in the suspected biter population. These bitemark cases are best exemplified with infant abuse victims where only a small number of known caregivers had contact with and access to the infant when the abusive attack occurred or in sexual assault cases where the sexual assailant was known to the victim. Supporting DNA evidence from swabbings of the bitemark in any given case can further aid in establishing biter identity or exclusion.

Historically, there are two issues in bitemark analysis that have led to the problem bitemark cases; operator bias and analyst error. Operator bias is a well known problem in many scientific investigations. It is incumbent on the operator to be able to know where bias can be introduced in a given case and what steps to take to avoid the introduction of bias, including the use of an independent case review by another qualified analyst.

The problems with incompetency of the analysts have been of far greater concern. Using poor quality bitemark evidence, poor methodology as well as the introduction of the extraneous issues of bias in the investigation, opinions have been rendered in bitemark cases that are not scientifically supported. It has been these cases by a small number of analysts that represent the majority of past wrongful convictions based, in part or completely, on bitemark analysis. Contemporary bitemark analysis includes processes to avoid errors by the analyst before preparing the final bitemark case report.

The 2009 National Academy of Sciences Report, "*Strengthening Forensic Science in the United States: A Path Forward*" correctly identified the problems of bias and analyst error and made further comments on where they felt the process of bitemark analysis should improve. However the report completely neglected to mention where bitemark analysis was an appropriate methodology in criminal investigations, where properly applied bitemark analysis had contributed to successful criminal prosecutions in assault and abuse cases and how to strengthen those aspects of bitemark analysis on "...the path forward."

The evolving future of bitemark analysis will include competency testing for bitemark experts, improved guidelines and standards, research in areas of pattern creation and analysis as well as the relationship between the biter's dentition and the patterns created by those teeth when biting living skin.

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