National Institute of Justice

Award Title: The Interpretation of Patterned Injuries in Medicolegal Death Investigation

Award Description:

A common problem in Forensic Pathology practice is the evaluation of patterned injuries of the skin. These injuries can provide important information about the nature of an object that was used to inflict trauma on a victim. In some cases, such as gunshot wounds, there is a rich literature on the proper characterization of the injuries and the inferences that can be made. In most cases, however, the interpretation of these patterns is primarily a matter of personal experience and informal lore. Traditionally, the ability of a Forensic Pathologist to interpret patterned injury of the skin has been relatively unquestioned at trial. Over the past few years, however, there has been an increasing emphasis on more stringent application of Daubert criteria. While interpretation of patterned injury meets the criterion of general acceptance, there exists no demonstration of error rate, reliability, or other more quantitative measures of scientific basis. Like other traditional diagnoses, such as Shaken Baby Syndrome, that have had general acceptance, patterned injury analysis is now subject to challenge. There has been even less work in establishing the reliability of this practice than has been done in bitemark analysis. Further, there has been both significant use of image processing as well as challenges to image processing in the use of patterned injury analysis. The use of image processing in a federal death penalty case (US v. Bourgeois), has been the source of appeal based on lack of Daubert challenge. The FBI has established a working group to develop standards for the processing of forensic images in criminalistics. These guidelines have been well-received and have served as the foundation for evolving ASTM and ASCLD-LAB standards. A quantitative analysis of the usefulness of image processing in the analysis of images in forensic pathology, however, has not been performed, and no such standards exist for this specialty. First, we will address the basic issue of the ability of pathologists to interpret patterned injuries by means of an initial survey-based study of the precision and accuracy of patterned injury interpretation. This will be a preliminary study in which participants will be asked to identify ¿classic¿ injury patterns. A second study will address more equivocal patterns and attempt to provide some indication of accuracy of partial and deformed patterns. Second, we will address the usefulness of specific image processing methods that have been proven of use in other medical specialties in the interpretation of patterned injuries of the skin. In particular, we will examine the use of histogram-based contrast-enhancement methods on the detection and interpretation of patterned injuries with and without use of original imagery. The deliverables for these studies will be: 1) A quantitative error measure for patterned injury interpretation at the population level for forensic pathologists, on ¿classic¿ and ¿non-classic¿ patterns; 2) A quantitative measure of the usefulness of image processing methods on the detection and interpretation of patterned injury of the skin; 3) A quantitative measure of the accuracy and precision of postmortem injury measurement, and recommended protocols for increasing both.
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