## A47 Utilizing Reflectance Transformation Imaging (RTI) for the Analysis of Saw Mark Characteristics on Kerf Walls: A Comparison of Traditional Imaging Techniques.

*Britny Martlin*, Victoria, BC V8W 1E4, CANADA; Carolyn Rando, PhD, University College London, London WC1H 0PY, UNITED KINGDOM*

**Learning Overview:** After attending this presentation, attendees will have some understanding of what RTI is and how to use it for analysis, the traditional approaches to saw mark analysis, and the potential advantages involved in including RTI in the forensic analysis of saw marks on bone.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by suggesting that RTI, an inexpensive and easy-to-use technology, can be used for saw mark analysis with comparable results to traditional methods and, in some cases, can more greatly enhance characteristics. RTI has the potential to expand upon traditional analytical techniques and ameliorate imaging difficulties associated with more traditional methods.

RTI is a computational photography technique which documents and enhances the 3D reflectance properties of the surface of an object. A series of digital photographs are taken from a stationary camera position while the light source is projected from a different known angle. These photographic sequences are synthesized as Polynomial Texture Maps (PTM) and can be viewed much like a conventional 2D photographic image. However, unlike a traditional photograph, a PTM is derived from the 3D properties of the object, allowing the user to virtually re-light the object using the designated viewing software. Although RTI has primarily been used in the cultural heritage sector, it has recently transitioned into the realm of forensic science.

Traditionally, saw mark analysis is completed macroscopically, with low-powered stereomicroscopes or, more recently, Scanning Electron Microscopes (SEM). To assess the viability of using RTI for saw mark analysis, three different handsaws were used to fully section porcine radii, resulting in 42 kerf walls. All kerf walls were examined with the three traditional methods, as well as with RTI, utilizing a saw mark analysis methodology derived from Symes et al.[1]

The results demonstrate that RTI has a greater capacity for digital alteration and examination than the traditional methods, with statistical analysis demonstrating comparable accuracy. Macroscopic examination resulted in a lack of identification of kerf wall characteristics due to the lack of magnification used for analysis. Characteristics were often obscured during microscopic analysis due to surface reflectivity, and characteristics were also occasionally obstructed during SEM analysis due to the underlying bone morphology visible with SEM technology. Due to the digital abilities of RTI, neither surface reflectivity nor underlying bone morphology were a difficulty during analysis.

Although great care must be taken when obtaining the photographic sequences necessary for detailed RTI analysis, this study proves that RTI is comparable in accuracy to both microscopic and SEM analysis. RTI is also relatively inexpensive, expeditious, and easy to use in comparison to the more traditional methods. By creating a digital record that can be utilized by experts and untrained observers alike, RTI allows for an accurate, interactive digital record to be shared with other experts or retained for future examination, comparison, and teaching. With further research, RTI has the potential to assist in a holistic order of forensic saw mark analysis, documentation, and presentation.

**Reference(s):**

1. Symes, S.A., E.A. Chapman, C.W. Rainwater, L. Cabo, and S.M.T. Myster. 2010. *Knife and Saw Toolmark Analysis in Bone, A Manual Designed for the Examination of Criminal Mutilation and Dismemberment*. Washington, DC: US Department of Justice.

**Reflectance Transformation Imaging, Saw Mark Analysis, Forensic Anthropology**



*Presenting Author