H32 Skeletal Dismemberment Analysis Utilizing Surface Metrology

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The goal of this presentation is to explain the potential applications of 3D computer modeling and surface metrology to saw-related dismemberment of skeletal remains. Specifically, the correlation of the surface variables Pv and Pp to saw tooth deviation will be demonstrated.

This presentation will impact the forensic science community by showing how it will increase the range of saw characteristics that can be gleaned from their resulting kerfs, and allow for more accurate and confident identifications of the tools used in a dismemberment.

Saw kerf examination is a vital part of any investigation of dismemberment as it provides many clues to the characteristics of the saw that was used. The accuracy and confidence of the methods used in this examination are vital, as they must now hold up to *Daubert* standards of scientific evidence in court. Symes was the first to create real standards for saw kerf analysis, and established many of the still-used characteristics of saw kerfs in bone that can be tied to their acting implement.[1]

Over the last two decades, other researchers including Bailey, Freas, and Saville have attempted to reduce the characteristics of saws that create changes in kerfs on bone to their most fundamental elements. These studies have confirmed the ability to tie kerf features to saw types within levels of statistical confidence. This research, however, has focused largely on increasing magnification of kerf walls, or ignoring the kerf wall all together, and examining so-called false starts or incomplete kerfs.[2-4] Very little research has been done on the potential discriminatory uses of peaks and valleys of the kerf wall itself.

The present study examined experimentally created kerf walls on twenty-five pig femora. Each kerf was created by one of a group of hacksaw blades meant to represent the variability seen in this type of sawing implement. Stereo images were taken of each of the kerf walls using a Leica MZ16 and combined to create a 3D computer model. These models were then examined using the programs StereoExplorer and SFRAX 1.0 where thirty different variables were collected that describe changes in the kerf wall surface.[5-6] These measures were then compared to quantifiable features on the saws for any correlations.

Of the measured saw characteristics, saw set was prioritized because of its presumed affect on the kerf wall striations. A strong correlation (R^2>0.70) was found between the amount of saw set deviation and the depth of the kerf wall striations. Previously, the saw set was inferred solely from the kerf width. The presented method provides a new avenue to evaluate this feature of the saw. This measurement is sensitive to variation between the right and left sides of the saw; therefore, it can be used to identify individual characteristics of the saw resulting from manufacturing deviations. This study shows the potential application of 3D computer modeling for saw kerf analysis as a method not only for gathering more quantifiable information from kerfs, but also for changing the traditional ways in which kerfs are viewed and analyzed.

References:

1. Symes S. Morphology of saw marks in human bone: identification of class characteristics [dissertation]. Knoxville (TN): Univ. of Tennessee, 1992.
2. Bailey JA. Statistical analysis of kerf mark measurements in bone. Forensic Sci Med Path 2011;7:53-62.
3. Freas LE. Assessment of wear related features of the kerf wall from saw marks in bone. J Forensic Sci 2010;55(6):1561-9.
4. Saville PA, Hainsworth SV, Rutty GN. Cutting crime: the analysis of the “uniqueness” of saw marks on bone. International J Legal Med 2007;121:349-57.
5. http://www.leica-microsystems.com/products
6. http://www.surfract.com/index.html

Dismemberment, Surface Metrology, Kerf

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