H50 The Effect of Angle at Impact and Magnification Level on Striation Pattern Recognition

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After attending this presentation, attendees will understand the basic principles of sharp force trauma analysis, class characteristics associated with serrated and non-serrated blades, and how angle at impact and magnification level used during analysis influence the accuracy of blade type determinations.

This presentation will impact the forensic science community by introducing a methodology grounded in quantitative observation for the assessment of knife serration patterns which are left on cut surfaces.

Six knives were utilized in this study to create experimental cut marks in porcine costal cartilage (*Sus scrofa*), including four serrated knives and two non-serrated knives. Two rounds of cuts were made with the goal of ascertaining a baseline accuracy level. Angle at impact was not specified and magnification level was not controlled during the examination for these rounds. Once the cut marks were produced, the specimens were preserved in a 10% formalin solution and then evaluated using white light microscopy. The cut surface of each specimen was examined for the presence of patterned striations and a determination of "serrated" or "non-serrated" was made. To examine how angle at impact influences the accuracy of blade determinations, a third round of cuts were made where each knife impacted cartilage specimens at five different angles and the specimens were examined at five different magnification levels, which resulted in a total of 150 observations (six knives x five angles x five observations). The cut surfaces of the specimens produced during the third round were examined for the presence of patterned striations as well, but magnification level was strictly controlled. All of the specimens were examined under each magnification level before being re-examined under each subsequent magnification level. The samples were also re-coded before progressing to the next magnification level, which ensured that blade determinations were blind. This portion of the study was included in order to ensure the reliability of the results, while also illustrating the impact of magnification level on the recognition of striation patterns. In total, there were 210 observations included in this study (60 observations in rounds 1 and 2; 150 observations in round 3).

Blade-type determinations were made with 100% accuracy for all specimens included in this study, which demonstrates that serrated blades are distinguishable from non-serrated blades. Serrated blades produce distinct, patterned striations as they cut through cartilage, whereas non-serrated blades produce fine, unpatterned striations or no visible striations at all. This research also demonstrates that angle at impact does not affect the overall accuracy of blade-type determinations. However, the distance between striations on the cut surface does vary based on angle at impact, with cartilage specimens impacted at 15° and 25° angles displaying more striations than cartilage specimens impacted at 75° and 90° angles. This means that the distance between striations on the cut surface of cartilage specimens impacted at 15° or 25° angles is more challenging to measure, but the high number of striations allows for patterns to be more readily identified, thus leading to more confident blade type determinations.

The accuracy of blade-type determinations was also not influenced by magnification level used during examination. The use of lower magnification levels, such as 10x or 20x, is sufficient to make a blade type determination of serrated or non-serrated. These findings suggest that sharp force trauma analysts should select magnification levels at their own discretion and should not feel bound to use higher magnification levels in their examinations. In addition, these findings indicate that standard light microscopy techniques, which are readily available to the majority of forensic scientists, are sufficient in making accurate blade-type determinations and measuring striation patterns in cartilage.

Sharp Force Trauma, Class Characteristics, Striation Pattern Recognition

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