B157 Observations on the Incidence of Transfer of Fibers to Knives During Penetration Cuts

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After attending this presentation, attendees will have a better understanding of fiber transfer to knives during stabbings through clothing. Possible correlations were examined between the number of fibers transferred and their location on a knife blade versus the blade type, number of penetrations, direction of penetration, fabric construction, and fiber composition.

This presentation will impact the forensic science community by dispelling misconceptions about fiber transfer onto knife blades during stabbing incidents. This includes the expectation that serrated blades are significantly more prone to entrain and retain fibers than straight blades and that the fiber composition and/or fabric construction would significantly affect the number of fibers transferred. Fibers transferred to a knife blade can be critical evidence when the knife is recovered in a different location from the complainant and DNA is not probative to the case. While previous studies address the force required for a knife to penetrate a model of a clothed body or the fabric damage caused, there have not been previous studies looking at either the transfer of fibers to a knife during stabbing nor the variables that may impact the number and location of transferred fibers.

Pork shoulders were used as the knife penetration substrate. They were covered with four different types of fabric to mimic clothing: cotton-woven denim fabric, cotton jersey knit fabric, polyester tricot knit fabric, and polyester-woven windbreaker fabric. Single and double penetrations were made aligning the knife blade with the lengthwise direction, the crosswise direction, or on a diagonal of the fabric. The penetration cuts were made using either a serrated blade or a straight blade. Each sequence of variables was repeated three times for a total of 144 penetrations. After each penetration, the fibers transferred to the blade were collected and counted.

The average number of fibers collected after single penetrations with the serrated blade and with the straight blade were, respectively, 98 and 86 for the cotton denim fabric, 92 and 32 for the cotton jersey knit fabric, 80 and 105 for the polyester tricot knit fabric, and 54 and 29 for the polyester windbreaker fabric. These fibers were most frequently observed along the cutting edge and along the deepest point of penetration on both types of blades.

The average number of fibers collected after double penetration with the serrated blade and with the straight blade were, respectively, 102 and 80 for the cotton denim fabric, 72 and 63 for the cotton jersey knit fabric, 37 and 76 for the polyester tricot knit fabric, and 69 and 38 for the polyester windbreaker fabric. These fibers were most frequently observed along the deepest point of penetration after the double penetrations on the straight blade; however, this was not always the case for the serrated blade.

Significant numbers of fibers were transferred to the blades along the cutting edge and at the deepest point of penetration of the blade during penetration. Correlations were not observed between the number of fibers transferred, or their location on the blade, with blade type, number of penetrations, direction of penetration, fabric construction, or fiber composition. The expectation that more fibers would be transferred to a serrated knife was not supported by the observations.

Fiber, Transfer, Knife Cuts

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