CASE REPORT

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Damage to a Wire Security Screen: Adapting the Principles of Clothing Damage Analysis

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ABSTRACT: The analysis of damage to a wire security door in a homicide investigation is described. The principles of damage analysis to fabric weaves were utilized in the examination of the open mesh wires. The results supported only one of the two alternative scenarios proposed to account for the damage. The findings illustrate that valuable information from damage analysis may still be obtained from textile products traditionally only considered suitable for toolmark or physical fit evidence.

KEYWORDS: forensic science, criminalistics, damage, clothing, textiles, wire screen

Damage analysis of clothing is commonly used as evidence in serious crimes of violence such as homicide and rape and forms a significant part of biology casework in Victoria (1). Previous literature has shown that it is possible to distinguish a cut from a tear, a stab-cut from a slash-cut and whether the damage was ''recent'' (2).

The analysis of toolmarks to textile products has long been used to investigate the type of object that produced the impression or striation (3,4). However, few studies have been published utilizing the principles of analysis of damage to clothing in the examination of damage to other textile products. Information may be desirable from these types of textiles especially when toolmarks are neither present, nor informative nor relevant.

The following homicide case recently examined at this laboratory utilized the principles of damage analysis to fabric weaves in the examination of damage to a wire security door. The findings were used in the trial to support the prosecution scenario and refute the alternative scenario proposed by the defense.

Case History (5)

A man found his wife dead on the front pathway of their house in suburban Melbourne after they had been arguing. Crime scene examiners from the laboratory found a bullet entry and exit wound on each side of her head. Police searching the scene heard the neighbor from directly across the road chipping at a wooden front door. On closer investigation this male was found to be naked and covered in oil, trapped in his front porch attempting to open the closed front door with a knife. A wire security door was locked at the front of the porch. The police prised open the security door along one outer edge and the male was apprehended. His premises were searched and a firearm was located on the sitting-room floor.

It was alleged by the prosecution that the neighbor had been watching erotic videos in his sitting-room when angry voices from across the road disturbed him. This annoyed him so much that he loaded his firearm, cut the wire of his security door from the inside with the knife, rested the gun barrel on the cut wires and fired. During the subsequent door knock by the police he hid in his sitting-room but curiosity overcame him and he returned to the porch to look at the scene. The wooden front door accidentally closed behind him and he was thus trapped in the porch.

The defense alleged the damage to the security door was caused by police pushing their hands through the wire to open the door. The damage to this door thus became a central issue. The security door and the knife were brought into the laboratory for examination. Neither the toolmark examiner nor the gun shot residue analysis could obtain any evidential value. Consequently it was requested if any information could be obtained from damage analysis.

The security door consisted of a metal wire mesh inner face and a metal lattice outer face. There was ''recent'' damage detected that was considered distinct from normal wear and tear. There was a ''hole'' in the wire mesh inner face above the handle which was contained within a metal lattice of the outer face (Fig. 1); the severed ends were clean and shiny. The blade of the knife had a single, moderately sharp cutting edge approximately 21 cm in length which curved to a slightly bent tip from a maximum width of approximately 4.1 cm.

Methods

The damage was first examined macroscopically. The wire mesh construction could be visualized as an open weave. Microscopic examination was performed using a WILD M650 surgical operating stereomicroscope varying to $\times 40$ magnification. Points such as planar array, found in the clean cuts where the ends of the wires lined up in the same plane, and distortion were noted (2,6).

Simulation experiments (1,7) were initiated to reconstruct the provided scenarios. The knife was used in controlled actions to cut the wire mesh in an undamaged area of the screen and then a cylindrical metal rod (approximating a gun barrel) was placed on

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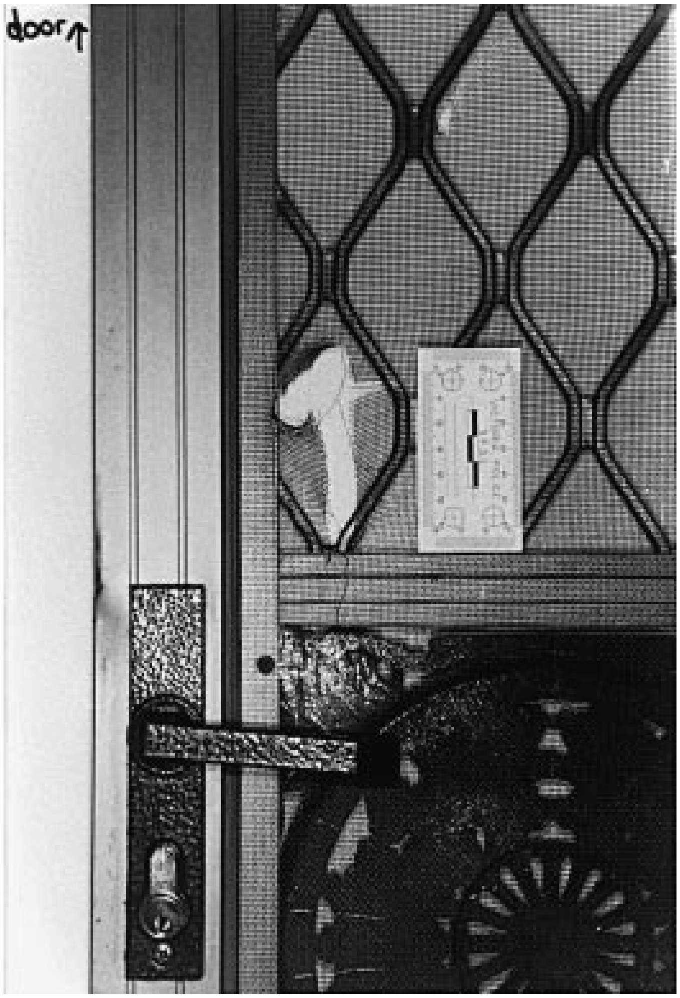

FIG. 1—*Damage to security door—inner face.*

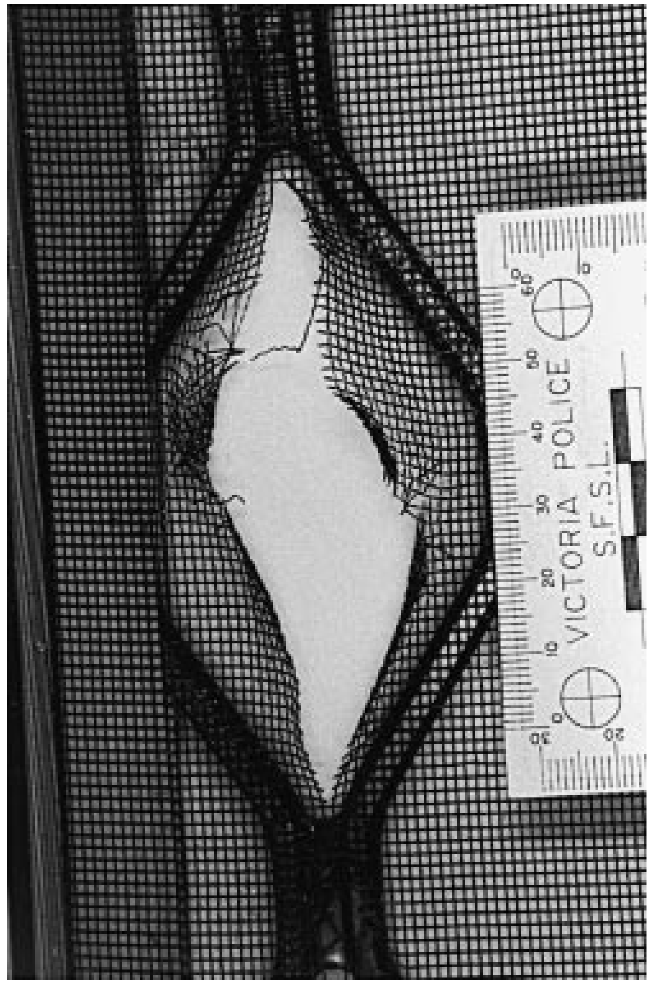

FIG. 2—*Knife cut and cylindrical rod simulation.*

the wires. In the second series of simulations a hand (gloved to protect the wearer) and the metal rod punctured and penetrated the screen in undamaged areas. It was noted that the metal lattice surround allowed only partial penetration of the hand.

Following each simulation experiment the damage produced was also examined macroscopically and microscopically. This damage was then compared with the ''evidence'' damage and assessed as to whether it was similar or dissimilar in characteristics.

Results

The ''evidence'' damage was irregular in shape and approximately 8 cm in the vertical direction and approximately 4.5 cm in the horizontal direction. No human matter was detected in this area.

In the first series of simulations the knife readily cut the wires and produced features similar to cuts in an open weave. Once a severance existed, a moderately heavy cylindrical object could push the severed and unsevered wires together, causing distortion and altering the weave pattern (Fig. 2).

In the second series the wire mesh screen was punctured with a cylindrical object and with fingers. Features were produced that were similar to tears and punctures in an open weave (Fig. 3).

The original damage detected to the screen was similar in macroscopic and microscopic characteristics to the damage produced in the first series of simulations. Part of the original damage exhibited characteristics of a cut such as neat cut ends and planar array (A, Fig. 4); the knife provided may have produced this cut. The remaining part of this ''evidence'' damage exhibited distortion, which corresponded to the placing of a moderately heavy object on the severed edges of the wires and/or the intact adjacent wires (B, Fig. 4).

The distortion produced in the experiments simulating the defense scenario was similar in characteristics to the distortion as detected in the ''evidence'' damage. However, as no characteristics of a cut were produced in the experiments simulating the defense scenario, and no cutting implements were involved, the second scenario was excluded as the sole origin of the original damage detected to the screen. In addition, the presence of a recent ''nick'' detected on the metal lattice in the ''evidence'' damage indicated that a sharp implement had been used (C, Fig. 4).

It was also requested by investigators to determine the direction of the damage (that is, from the inside or outside). However, in general it is not possible to determine the original direction of a thrust into a textile by examining the subsequent features of the severance in the textile. The material of the textile may be withdrawn with the implement in the direction of the implement's removal, complicating any interpretation.

Discussion

The wires of the screen were considered as an open weave, and damage characteristics to woven fabrics were applied in the analysis of the damage to the screen. The knife was included as the possible weapon that caused the cuts. It readily cut the wires with little resistance. Cutting features such as planar array and cut wire ends were produced in the simulations using the knife. Once the wire mesh was penetrated, the wires were easily pushed together and the weave pattern altered.

The ''evidence'' damage was most similar to this combination cut and ''pressing'' of wires together, and the defense scenario was excluded as the sole origin of the damage. Although the link between the knife and the ''evidence'' damage was weaker than is commonly found in toolmark evidence, sufficient evidence was still obtained from the damage analysis to discriminate between two proposed scenarios. It was also demonstrated that a hand could not penetrate the screen due to the metal lattice surrounds (in fact, the purpose of a security door).

The metal wires did not revert to their original position (as is the case with many fabric weaves) so that information could be obtained as to the sequence of events; the pressing of the wires together followed the cutting action. However, the placing of an object against severed ends of a soft fabric weave may not leave any detectable evidence.

The above analysis was the subject of a ''voir-dire'' at the trial in the absence of the jury. Further simulation experiments with the knife being used to cut the screen were performed in the courtroom.

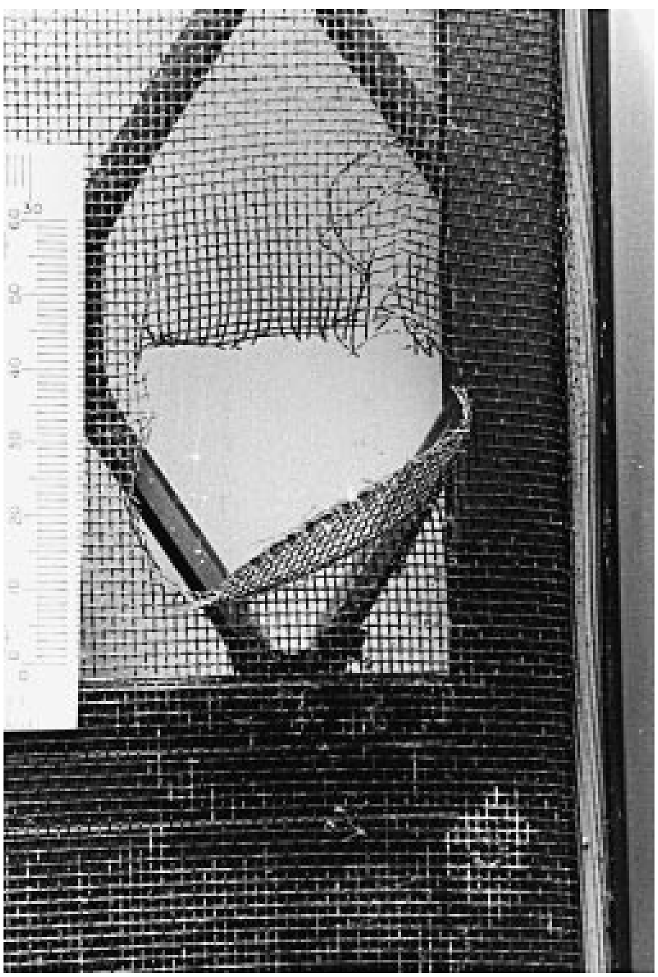

FIG. 3—*Puncture produced with (gloved) fingers.*

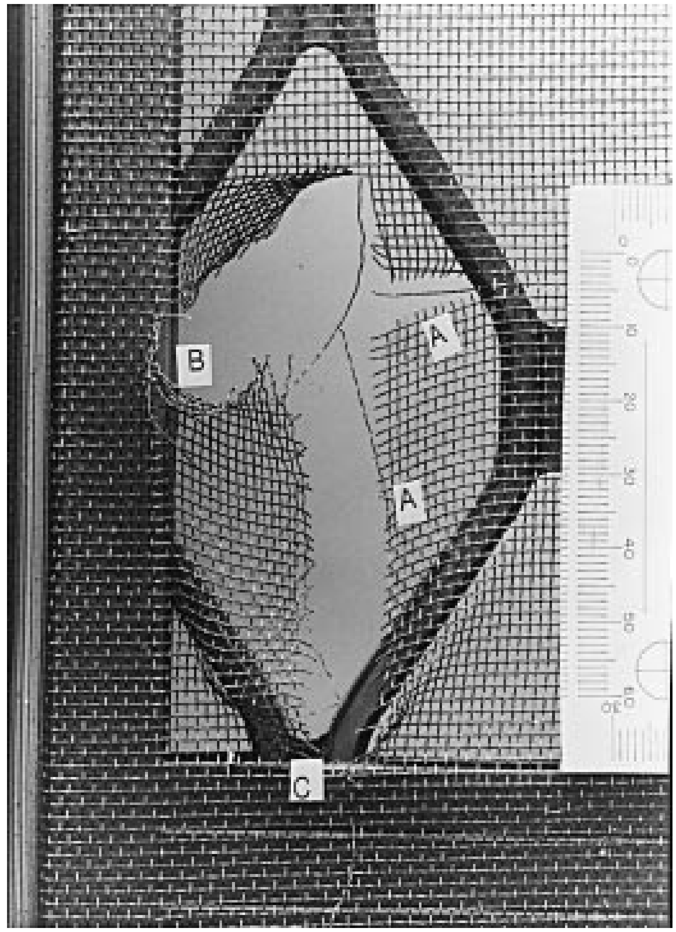

FIG. 4—*Close-up of ''evidence'' damage: (A) characteristics of cut (B) distortion, and (C) area of nick on metal lattice.*

The evidence was accepted by the judge and subsequently presented before the jury. Evidence such as the firearm evidence was persuasive and the accused was found guilty of murder.

These findings suggest that interpretation of damage analysis to textiles other than those used in clothing manufacture may still provide valuable information in the absence of toolmark impressions or physical fits. However, it should be remembered that simulations can never replicate an event, because variables such as degree of force used, position of participants and condition of the implements are unknown or cannot be replicated. Consequently, care must be exercised in drawing conclusions.

Also, due to weapons being mass produced and the fewer characteristics obtainable in this type of analysis compared with toolmark examination, the probability of a particular weapon causing the damage cannot be determined. Many textiles may also not be suitable for the translation of clothing damage analysis principles. Nevertheless this case study shows that damage analysis may and will be especially useful not only in clothing fabrics but also in other textiles. Further cases of damage to wire mesh screens have been subsequently examined by this laboratory and evidential value obtained.

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