CASE REPORT

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Comparing the Alleged Weapon with Damage to Clothing—The Value of Multiple Layers and Fabrics

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ABSTRACT: The examination of damage to multiple layers of clothing of an attempted murder victim is described. The large number of cuts to the garments, the multiple layers and the varying types of fabric composing these garments gave valuable information as to the possible implement causing the damage. The results also show that some types of material may better reflect the geometry of the suspect weapon than others.

KEYWORDS: forensic science, criminalistics, damage, clothing, textiles, knives

Glossary

Simulation—an experiment designed to reconstruct a proposed scenario as accurately as possible.

Stab-cut—cut produced by penetration of an implement through the material.

Slash-cut—cut produced by implement cutting along material.

Snippets—short segments of yarn created if a knit fabric is cut at an angle to the thread direction.

Directionality—profile of cut indicates the orientation of cutting edge or back of blade.

The examination of damage to clothing and other textiles may provide information as to the possible implement causing the damage and the manner in which it was caused (1,2). This information may be especially useful when ''unusual'' weapons, which may cause distinctive characteristics, are involved (3).

Many cases may only have one area of damage, or damage to a single garment. The following recent attempted murder case examined by our laboratory shows that valuable information may be gained when multiple areas of damage in varying types of fabric are encountered. In addition, the distinctive cuts produced by the alleged weapon in the simulation experiments assisted in linking this weapon to the damage in the victim's clothing.

Case History (4)

A 92-year-old Melbourne woman visited her bank to complain about discrepancies in her account. A female bank teller who had stolen $6000 from the elderly lady's account to fund a gambling habit panicked and visited her that night. She said she was sent from the bank to sort matters out and obtained statements and the victim's check book, which the bank teller later burnt. The following morning the bank teller returned to the house with a knife and stabbed the victim 18 times in the stomach and back before going to work, changing her clothes on the way. After work she gambled on the poker machines and then went home and cleaned the knife. The victim was found the next morning by a neighbor. The police arrested the bank teller some eight days later and she partially admitted to stabbing the victim with a boning knife. However, the defense alleged she was coerced into these admissions and that the police committed improprieties.

The victim's clothing was brought into the laboratory for examination and comparison with the boning knife. There was damage detected to a long-sleeved cardigan (knitted jacket), a short-sleeved cardigan, a vest, a spencer (long-sleeved ladies' undergarment), a pair of slacks, a pair of tights and a pair of briefs. The knife had a stainless steel, moderately sharp blade approximately 15.5 cm in length, which curved to a point from a maximum width of approximately 2.3 cm (Fig. 1). No blood or fibers were detected on the knife and there was no other biological or chemical evidence.

Methods

The damage to the garments was first examined macroscopically at the fabric level. All garments were knitted but varied according to the looseness and type of the knit; the location and profile of the damage were recorded. The damaged areas were then examined microscopically at the yarn and fiber level, using a WILD M650 stereomicroscope varying to $\times 40$ magnification. Features such as snippets and neatness of the fabric edges were noted (2,5).

Simulation experiments were performed in order to determine if the knife provided may have caused the damage to the garments. The experiments were performed on the upper back undamaged areas of the two cardigans, as these garments had the more distinctive areas of damage. A piece of rolled pork, protected with paper, was used as a backing medium in order to simulate a human body (1). Following the simulation experiments, the subsequent damage produced was examined macroscopically and microscopically. This damage was then compared to the ''evidence'' damage and assessed as to whether it was similar or dissimilar in characteristics.

Results

The victim was wearing garments layered as depicted in the photograph (Fig. 2). The short-sleeved cardigan was worn under

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FIG. 1—*Boning knife collected from suspect.*

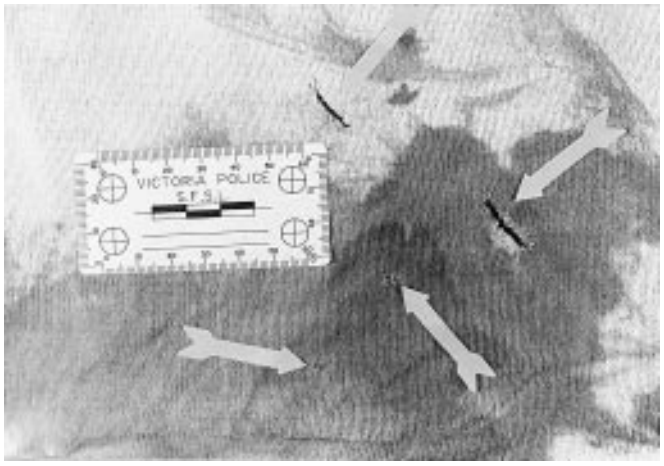

FIG. 3—*Cuts in back of cream cardigan.*

FIG. 2—*Victim's clothing (front view).*

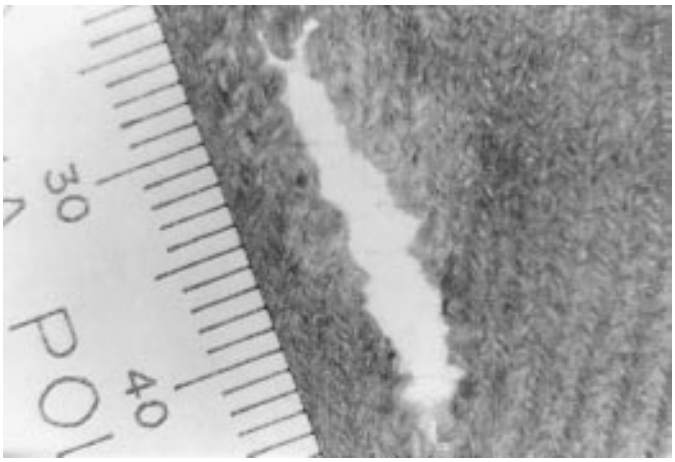

FIG. 4—*Y-shaped cut in cream cardigan.*

the long-sleeved cardigan and over the vest. The spencer was worn under the vest and next to the body (obscured in photograph).

There were a total of 49 stab-type cuts to the seven items of clothing, predominantly to the upper body garments. There were cuts to the front of the upper body garments that varied in number and size from six cuts with a maximum length of approximately 2.3 cm in the vest to no cuts in the front of the long-sleeved cardigan (indicating this cardigan was worn unbuttoned). The cuts to the back of these garments varied in number and size from eight cuts with a maximum length of approximately 2.0 cm in the short-sleeved cardigan to six cuts with a maximum length of approximately 2.0 cm in the long-sleeved cardigan. Correlating the cuts in the various items of clothing indicated the minimum number of thrusts to the front and back of the victim.

Several of the cuts in the two cardigans displayed a distinctive ''Y''-shaped feature at one end (Figs. 3 and 4). The profiles of the cuts in the ''looser'' knit garments, such as the spencer (Fig. 5) and the vest, were less distinct and less informative.

In the simulation experiments cuts were produced, depending upon the orientation of the line of the fabric, which had a distinctive Y-shaped feature at the top of the cut corresponding to the back of the blade (Fig. 6). Thus directionality could be ascertained in these cuts.

Discussion

Simulation experiments indicated that the boning knife provided could have produced all the damage detected to the clothing. Not only was it suitably sharp to have penetrated all the layers of the garments, and of a suitable width, but in the appropriate fabric it

FIG. 5—*Cuts to front of spencer.*

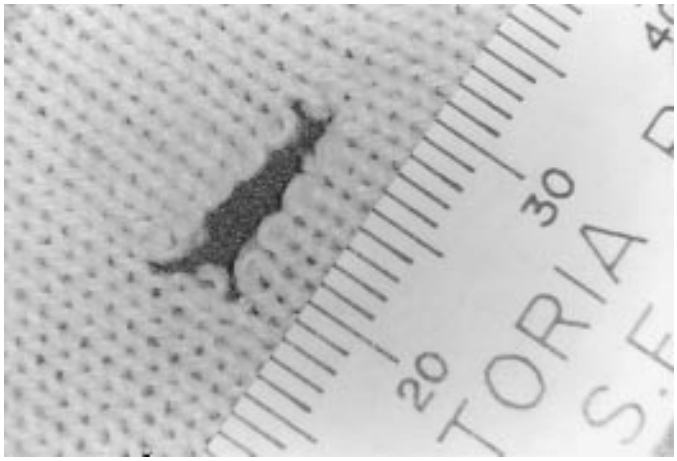

FIG. 6—*Cut produced in simulation experiment.*

produced distinctive cuts with a Y-shaped feature at one end. It was postulated that this feature may have been produced by the curved back of the blade.

The victim survived the attack, possibly because she lay immobile due to shock and because she wore a large number of garments that may have acted as bandages. The evidence of the damage was contested at the pre-trial hearing. However, the accused was committed to stand trial and shortly before the trial date, pleaded guilty. Although the damage evidence was not accompanied by any other biological or chemical evidence, and no statistical probabilities could be given, it still provided sufficient weight to link the weapon to the victim.

The tension and elasticity of the knit in all the garments reflected the damage observed. Distinctive cuts were seen in the tighter knitted garments but the looser, more elastic garments had cuts with fewer characteristics. These findings emphasize that, even though a weapon may produce outstanding characteristics, this will be dependent on the particular medium on which it is used and that, therefore, simulation experiments should be performed on either the damaged material itself or material closely approximating it.

Caution should be exercised when it is possible that more than one weapon may be involved—this may necessitate the use of more simulation experiments. It should also be remembered that simulation experiments can never replicate a crime event; variables such as position, movement and body weight of the individuals are unknown or cannot be duplicated. Knives are also mass produced so the probability of a particular knife causing the damage cannot be ascertained.

This study shows, however, that valuable information may be obtained from damage analysis, particularly when multiple cuts or fabrics are involved.

Acknowledgments

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