CASE REPORT

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Identification of a Murder Weapon by a Peculiar Blunt Force Injury Pattern and Histochemical Analysis

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ABSTRACT: Attempts to determine the instrument in the brutal killing of a middle-aged male resulted in the positive identification of an auto jack column as the actual instrument used. This was accomplished by the use of three modalities: (1) the edge of the jack column conformed exactly to a multi-curved laceration in the forehead (site of lethal injury), (2) blood found within this edge of the jack column afforded the same blood type as that of the victim, and (3) tissue sections made of the blood and debris from this edge of the jack column revealed tissue fragments containing human keratin (antihuman keratin technique) and positive staining with collagen stains.

KEYWORDS: criminalistics, injuries, identification systems

It is not uncommon for a forensic pathologist to be queried in a trauma case as to the capability of a certain instrument in causing a particular traumatic injury. However, it is only in rare circumstances that the pathologist can testify that a specific instrument is, in fact, the actual instrument of death. It is the purpose of this paper to present details of a case in which the use of scientific techniques enabled us to make the assertion that a specific object was such an instrument.

Case History

Three individuals lured a 36-year-old male machinist from a local bar to an apartment with the promise of a cocaine deal. The three planned to substitute a worthless substance for the cocaine, but when they discovered he had no money they savagely beat him outside the apartment, stuffed him in the trunk of his own car, and drove him to a secluded area of the waterfront. There, they brutally beat and killed him with a jack and stuffed him under a discarded sofa. At the time of autopsy, there were no suspects and the instrument used in the murder had not been found.

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Autopsy revealed multiple lacerations and contusions of the face, chin, and right knee; contusions of the anterior and posterior thorax and legs; and comminuted fractures of the frontal and parietal bones. The left frontal and parietal lobes of the brain were severely lacerated and contused.

The left forehead above the left eyebrow contained a patterned gaping laceration measuring 3.2 cm from the left lateral forehead to a point 1 cm above the medial aspect of the left eyebrow and 4 cm from the same point in the left forehead 4 cm towards the midline, 2.8 cm superior to the medial aspect of the left eyebrow. The frontal bone was comminuted below this point with many small pieces of bone contained within the wound, as well as fragments of dirt. This wound presented an unusual pattern characterized by two rounded peaks on the medial aspects of the wound (Fig. 1). This segment containing both peaks was removed, placed in fixative after pinning, and stored for future comparison. The information regarding the laceration with the peculiar injury pattern was supplied to the police to assist them as in an investigative lead.

A few days later, the victim's auto was identified in the driveway of one of the suspects, leading to the arrest of the trio. The trunk of the auto contained a bumper jack and other tools containing blood which were submitted to our office for examination.

Materials and Methods

One end of the jack column was slightly distorted, displaying the configuration of a double-rounded peak which visually appeared identical to the peculiar wound pattern that had been noted on the forehead and placed in fixative. A coagulated bloody substance admixed with a greasy material was noted within the cavity of this end of the jack column extending from the tip for a distance about 1.5 cm into the cavity on the side corresponding to the curved peaks. Samples of this material were removed by scraping, and were submitted both for histopathological-histochemical and serological examination. Following removal of the bloody material,

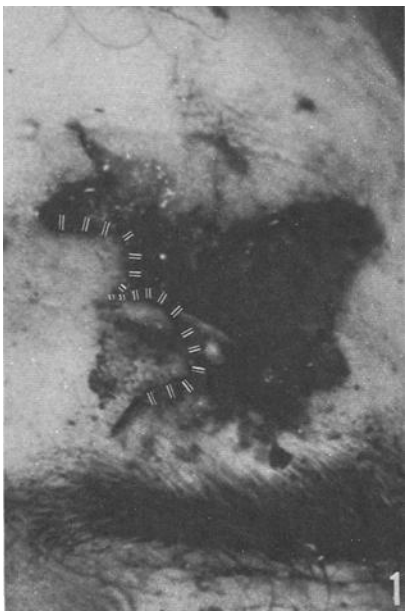

FIG. 1—*Lethal wound—note the unusual pattern characterized by rounded peaks* (arrows).

a negative cast of the suspected end of the jack column was made using a dental casting material, Jeltrate Alginate Impression Material Type 2® (normal set), which sets with relatively no shrinkage. A positive cast was then prepared by pouring Cerrelow 117 alloy [*1*] which is composed of bismuth, lead, tin, cadmium, indium, and gallium and melts at a temperature of about 43.3°C (110°F). There was no discernible shrinkage of the alloy. The skin specimen containing the double-rounded peak was then placed within the cast displaying an exact fit (Fig. 2) reminiscent of a cookie cutter. Specimens submitted for serology were identified as human blood Type B positive blood. This was the same type as that of the victim.

Specimens submitted for histopathology were processed and stained with H & E®, Masson's Trichrome Method, and the peroxidase-antiperoxidase (PAP) method for human keratin using the Dako Pap Kit® (K518) (supplied through the courtesy of Dako Corp., Santa Barbara, CA). Controls of human skin keratin were also used. The H & E specimens demonstrated the presence of fibrous tissue admixed with masses of red blood cells, fibrinous material and dirt, and a few cellular structures with nuclei. The trichrome stain afforded positive staining for collagen. The peroxidase-antiperoxidase method demonstrated a positive result for human keratin (Fig. 3). The control slides were negative for human keratin.

Discussion

The major lethal injury was severe brain damage corresponding to the laceration over the left forehead which contained the peculiar patterned injury. Although the presence of blood within one end of the jack corresponded to the blood type of the victim, one might counter that some bloody substance may have splattered into the jack at the time he was placed in the trunk of the car. However, the presence of blood, cellular structures, and fibrous material with the tinctorial properties of collagen indicates that tissue elements within the blood resulted from the contact of the jack with skin. Although the trichrome staining method is nonspecific for human collagen and, in fact, may stain other substances as well, the identification of human keratin by the PAP method provides strong evidence that the jack did, indeed, contact human skin. The immunoperoxidase techniques, introduced by Sternberger in 1970 [*2*], are extremely sensitive for particular cellular and tissue antigens.

The anatomic position of the patterned laceration with the double-rounded peaks indicates

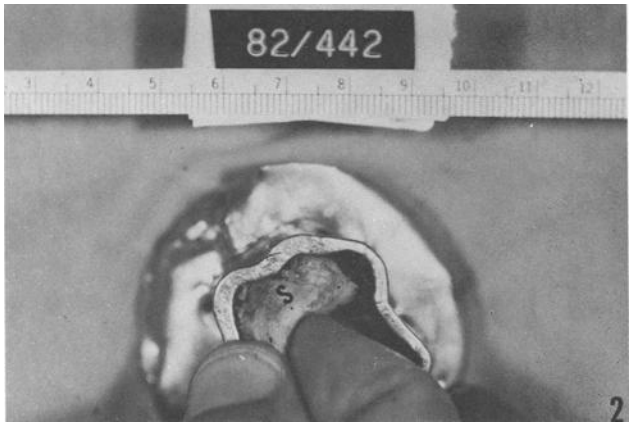

FIG. 2—*Cerrelow 117 alloy cast of the end of the suspected jack column showing the peculiar pattern depicted in the wound in Fig. 1. The rounded peaks on the skin specimen* (s) *display an exact fit with the rounded peaks of the cast.*

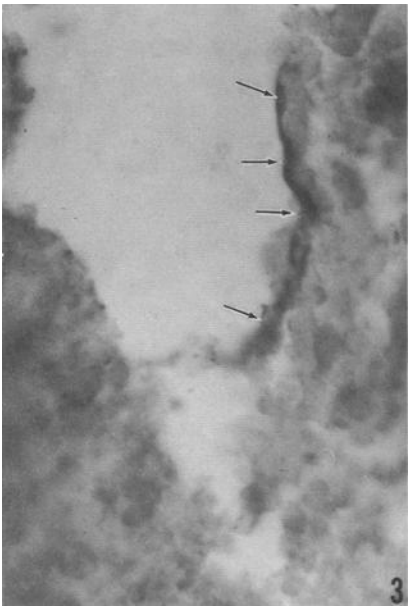

FIG. 3—*Microscopic section of material from end of jack showing a band of human keratin. PAP method for human keratin* ×*250, H & E* ×*400.*

that the forehead was initially only struck by the distorted edge of the jack column containing the corresponding rounded peak configuration.

References

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