G14 Environmental Scanning Electron Microscopy and Other Techniques in Cutting Crime Investigation: Case Report and Review of the Literature

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After attending this presentation, attendees will understand some principles of investigation of a dismembered body concerning the cause of death and the identification of the tools used to separate arms and legs from the trunk.

This presentation will impact the forensic community by suggesting a novel approach for the analysis of cutting crimes in general and dismembering in particular.

Herein investigators present the case of a 40-year-old female killed by throat cutting and consequently dismembered. She was found cut into 30 pieces inside three plastic bags in a garage.

Dismemberment is the act of cutting, tearing, pulling, wrenching, or otherwise removing the limbs from the trunk of a living or deceased object. It may be practiced upon human beings as a form of capital punishment, a result of a traumatic accident, or in connection with murder, suicide, or cannibalism. After killing the victim, the murderer uses a very sharp cutting weapon (a saw, knife, axe, etc.) to sever the limbs and cut the body into pieces. The operation is generally carried out immediately after the crime, although more rarely a long time may pass between the two events. There are two types of dismemberment that are commonly seen: localized, such as the removal of the head or hands in an attempt to hinder identification of the victim, or generalized at multiple sites (commonly bisection of limbs or disarticulation of the joints) to aid in the disposal of the body. In these cases a new pattern of investigation must support classical techniques to solve the following forensic issues:

- The evaluation of the time since death and of the time since dismemberment. Indeed, exsanguinations and dismemberment of the body prevent an accurate evaluation of lividities and rigidity.
- The identification of the tools used to cut the body. Careful, thorough investigation is a key point to ensure that potential physical evidence is not tainted or destroyed. In particular it is essential to identify any potential sharp cutting weapons at the crime scene. Moreover, when saws are used to cut the body, characteristic tool marks are left on the bone. The nature of the marks depends on the size, shape, width of the saw, and on the sawing action of the user.

Environmental Scanning Electron Microscopy (ESEM) may help in identifying the specific saw that has been used in the act of dismemberment. ESEM can detect and measure different types of striations, paint traces (such as rust inhibitor paints) or metal residues remaining on the bone after the cutting.

In the case presented, the determination of potassium levels in the vitreous humour and their time changes showed that the victim had been killed 20 – 25 hours before the death scene investigation.

The absence of lividities combined to histological and immunohistochemical investigation of the skin let investigators classify the dismembering injuries as non-vital wounds and to estimate the time interval between the death and the dismembering.

However, the most interesting finding was the identification of the tools used to cut the soft tissues and the bones of the victim. Morphological and morphometrical analysis of the skin lesions pointed out that the arms and the legs were cut with a sharp knife, whereas the head was removed from the trunk by a woodworker saw. ESEM analysis determined that the bone injuries were produced by a particular type of saw covered by rust-inhibitor paint.

Cutting Crime, ESEM, Dismembering

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