Forensics in dermatology: Part I

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The following is a journal-based CME activity presented by the American Academy of Dermatology and is made up of four phases:
1. Reading of the CME Information (delineated below)
2. Reading of the Source Article
3. Achievement of a 70% or higher on the online Case-based Post Test
4. Completion of the Journal CME Evaluation

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Dermatologists and others involved in the delivery of dermatologic care.

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Learning Objectives
After completing this learning activity, participants should be able to define forensic terminology, describe aspects of the forensic examination related to skin findings, and understand the scope of forensics in dermatology, including the types of wounds and patterns of injury to the skin.

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Examination of the skin and adnexae is a critical part of the forensic examination. Little information on forensic sciences has been published in the dermatologic literature. Correct forensic terminology and documentation of dermatologic findings is of critical importance in forensic investigations. The skin may reveal clues to the identity of an individual and the time and method of death or injury. Normal postmortem changes in the skin are described along with pseudopathology and damage from postmortem animal activity. The forensic classification of types of injuries is introduced in this first of a two-part paper on forensics in dermatology. (J Am Acad Dermatol 2011;64:801-8.)

Editor's note: We recognize that readers may find portions of these articles disturbing. As you read, please consider the importance of recognizing cutaneous signs of abuse and neglect, as well as the possible consequences of ignorance of these signs.

Key words: abuse; bioterrorism; forensic medicine; gunshot wounds; homicide; neglect; poisoning; pseudopathology of skin; self-inflicted injury; suicide; torture.

The word "forensic" is derived from the Latin *forensis*, meaning "a forum," or "pertaining to the law."[1] Forensic pathology is defined as "the study and application of medical and pathology principles in determining the cause and manner of death in cases of violent, suspicious, unexplained, unexpected, sudden and medically unattended deaths." This definition has come to include clinical forensics, which is concerned with the study of living victims.[2]

With the formation of the American Academy of Forensic Sciences (AAFS) in 1948, sections including pathology and biology, criminalistics, toxicology, engineering sciences, questioned documents, forensic odontology, anthropology, jurisprudence, psychiatry, and general forensic science were formally recognized.[3] Many other areas in forensics have been established and play a crucial role, such as forensic entomology. Little has been published on the subject of forensics in the field of dermatology. Examination of the skin is a vital part of the forensic examination, often revealing patterns of injury suggesting a particular etiology, signs of internal disease, or clues to the identity and habits of the deceased. The dermatologist may rarely be called upon to render an opinion regarding a suspicious death, but are likely to encounter abuse or neglect in living victims. Recently, dermatologists have played an important role in the preparation for and identification of bioterrorism threats.[4,5] In this two-part review, we offer an overview of dermatologic findings in forensic pathology and clinical forensics and highlight their significance.

CAPSULE SUMMARY

- Examination of the skin is a critical part of the forensic examination, revealing clues to the identity of an individual, time of death or injury, signs of internal disease, or external trauma.
- Normal postinjury and postmortem changes in the skin and signs of disease or traumatic findings are described. Distinguishing wounds include injury from sharp (incised and stab wounds) or blunt (abrasions, contusions, and lacerations) instruments, gunshot, burns, electrocution, environmental (hypothermia, hyperthermia, drowning, and lightning) and vehicular injury.
- The patterns of injury can be telling with regard to the cause and circumstances of injury (ie, abuse, neglect, assault, self-inflicted injury, suicide, torture, poisoning, and bioterrorism/biowarfare).
- Hair and nail findings can be informative in forensic investigations.
- A dermatologist's input is invaluable in distinguishing pseudopathology from true pathology and aiding in the diagnosis and management of forensic cases.

POSTMORTEM SKIN CHANGES

Key points

- **Normal gross postmortem skin changes include algor mortis, livor mortis, and rigor mortis**
- **Decomposition of the body occurs through autolysis and putrefaction, or less commonly by mummification, adiopocere formation, freezing or freeze drying, or tanning**
- **Focal dermoepidermal separation, eccrine duct necrosis, and dermal degeneration are normal postmortem histologic changes**

It is important to recognize the normal changes that occur in the postmortem period as distinct from traumatic injuries. One of the earliest changes seen after death is algor mortis, or cooling of the body. The rate of cooling can be affected by numerous factors, including body mass, body surface area, posture, clothing, and environmental factors. Livor mortis, or postmortem hypostasis, is staining of dependent skin by pooled intravascular blood. It begins to be evident about half an hour after death and by 6 hours has increased significantly (Fig 1). It may appear even sooner in the context of cardiac failure. Livor mortis spares mechanically compressed areas flattened by contact with objects such as clothing, where pressure prevents blood from filling subcutaneous veins. Livor mortis is particularly useful in establishing if the body was moved postmortem. Livor can shift if a body is moved (blood remains fluid even after death because of the activity of fibrinolysin), but eventually becomes fixed with hemolysis and decomposition. In addition to the location of livor, the hue can provide clues. A victim of carbon monoxide poisoning may have pink livor mortis, while methemoglobinemia can cause a brown lividity. Bronze hypostasis can be

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