Chapter 2

Postmortem Changes

The “Great Pretenders”

Summary

After death, natural degradation of a body is manifest as a sequence of changes. Certain postmortem changes, despite being affected by numerous variables, remain rooted as popular methods in the determination of the time of death. A pathologist can also be faced with confounding postmortem changes and artifacts, which either alter real injuries or mimic trauma.

Key Words: Postmortem changes; rigor mortis; embalming; entomology.

1. INTRODUCTION

Deaths under medicolegal investigation are frequently unwitnessed and remain undiscovered for a period of time. As a result, the pathologist encounters postmortem changes that alter and obscure pathological findings, hindering their assessment in the determination of the cause of death. These changes can mean that “no anatomic cause of death” is found. Postmortem changes also mimic injuries, potentially shifting the focus of a medicolegal investigation.

Certain bodily changes are assumed to occur at a constant rate after death (“rate parameters”); therefore, documentation of their extent at a specific time can be extrapolated back to the time of death. A review of standard textbooks of forensic medicine written in the last 50 yr shows that despite the myth fostered by popular literature, television, and movies that the time of death can be determined accurately within a narrow time frame, the reality is that the evolution of various postmortem changes is imprecise, and determination of the time of death is only an estimate (1–8). The pathologist can still be asked during an investigation or in court to determine the time of death; however, the pathologist is at a disadvantage in this determination.
Postmortem changes observed during an autopsy are made after the body has been recovered from the scene. Various intervening events (e.g., manipulation of the body, storage in a morgue cooler) mean increased inaccuracy to an already imprecise determination of time of death. Examination at the scene is the best time to record these findings.

Rigor mortis, livor mortis, temperature change, decomposition, and gastric emptying are examples of postmortem changes that progress after death and are within the scope of a pathologist’s observations during autopsy. Other measurable parameters, such as vitreous potassium, are affected by numerous variables (e.g., antemortem concentration, possible concentration differences between eyes, renal function; see also refs. 9–17). Various biomarkers used to estimate the postmortem interval are beyond the scope of the usual forensic pathology practice (18). A combination of observations can improve the accuracy of time-of-death estimation (19).

2. RIGOR MORTIS

Rigor mortis is defined as postmortem muscle contraction owing to locking of actin–myosin filaments because of decreased ATP synthesis (20).

2.1. Involvement of Involuntary Muscle

Contraction of arrectores pilorum (smooth muscle of hair follicles) manifests as “goose bumps” (cutis anserina; Fig. 1).

- Significance
  - Exposure to cold postmortem.

Seminal vesicles (smooth muscle) can contract (4).

- Significance
  - Contraction leads to slight expulsion of seminal fluid at tip of penis suggesting sexual activity prior to death (Fig. 2).

Fig. 1. Cutis anserina ("goose bumps") caused by cold exposure after death.