K24 Fatal Unintentional Cocaine Overdose: The Importance of a Forensic Scene Investigation

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Learning Overview: After attending this presentation, attendees will understand the importance of a forensic site inspection in a case of overdose cocaine abuse. Hyperthermia is difficult to find in postmortem, as cocaine overdose deaths are not always immediately discovered, and the body remains exposed to thermal changes for a long time.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing information about the interpretation of hyperthermia by cocaine-related deaths, which is still difficult and disputed. One of the reasons why literature offers few toxicological data about hyperthermia by cocaine involving death is data lacking about forensic scene investigations.

The correlation between mortality from cocaine and high ambient temperature is widely documented in scientific literature. Cocaine use is correlated with serious toxic effects and death. Subjects who use cocaine on a continuous basis have higher levels of circulating catecholamines. This condition manifests itself clinically as tachycardia, arterial vasoconstriction, enhanced thrombus formation, mydriasis, psychomotor agitation, seizures, coma, and even death. Cocaine modifies dopamine receptors and transporters involved in body temperature control. In fact, the substance determines cutaneous vasoconstriction at the peripheral level, while centrally interfering with the dopaminergic centers at the hypothalamic level, which are responsible for the regulation of body temperature. Hyperthermia is a well-known complication of cocaine use. However, this clinical finding is difficult to find in postmortem as cocaine overdose deaths are not always immediately discovered, and the body remains exposed to thermal changes for a long time. Therefore, the number of deaths due to hyperthermia related to cocaine abuse is quite limited. This study describes a case of cocaine-associated hyperthermia that resulted in death. A 33-year-old man was a known cocaine user. The decedent was found dead in his house by his live-in wife. The woman said the man had been using cocaine mainly by inhalation for about five years, had long been depressed, and did not leave home anymore. The wife also reported that around 8:00 p.m. she was outside with her children, and when she came back home, she discovered her husband lying on the floor of the house.

Rectal postmortem temperature (11:26 p.m.) was 41.7°C, compared to an ambient temperature of 30°C (11:30 p.m.). Hypostasis was abundant and disappeared on pressure; rigor mortis was in progression from small to large articulations. The autopsy examination showed only polyvisceral congestion; histological examinations documented myocardial fibrosis related to an initial dilated cardiomyopathy. No macroscopic abnormalities were observed in the other organs. During the forensic site inspection, three small packages containing white powder were found, later analyzed, and determined to be cocaine and lidocaine.

General drug screening conducted on a blood sample provided positive results only for residual cocaine (5.68ng/mL). Cocaine, Benzoylecgonine (BE), Ecgonine Methyl Ester (EME), and cocaethylene were measured in cardiac blood by gas chromatography and mass spectrometry (EME 1.34µg/mL, BE 4.78µg/mL, cocaethylene 0.021µg/mL), demonstrating high blood concentrations of the metabolites (6.12µg/ml), suggestive of a massive administration four to five hours before death. Considering the temperature measured during the site inspection about four hours after death, (already 41.7°C), it is hypothesized that at the time of death the victim had reached a hyperthermal peak of approximately 43–44°C.

This is a rare case in which it was possible, through the site inspection where the death body was found and the simultaneous measurement of the temperature, to identify the cause of death as hyperthermia resulting from massive cocaine intake, with no evidence of macroscopic and microscopic alterations that could justify death.

Hyperthermia, Site Inspection, Cocaine