K43 A Different Approach in the Estimation of the Time Since Death: Concurrence of Thanatochronological and Toxicological Data in a Case of Cocaine Assumption-Related Death

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Learning Overview: The goal of this presentation is to provide a different approach in the evaluation of the Postmortem Interval (PMI).

Impact on the Forensic Science Community: This presentation will impact the forensic science community by giving an example of how toxicology and thanatochronology could be integrated in the estimation of the time since death.

Introduction: The estimation of the time since death has been a longstanding issue for forensic pathologists. Its usefulness is mostly evident in cases of violent death, in which a precise evaluation of the PMI may help direct investigation enquiries to a potential suspect of homicide. Furthermore, it can sometimes be relevant in case of other crimes, such as failure to provide assistance.

As is widely known, the parameters obtained through the evaluation of supravital reactions, which are usually used to establish the PMI, are modified by variation of numerous factors related to the environment and to the body itself.[1,2] Because of this variability, it is not always easy to obtain a precise chronological reference of death, despite the technologic progress and the introduction of new methods, such as the biochemical analysis of vitreous humor and the study of electrical excitability of skeletal muscle; furthermore, often only a wide time window is obtained.[3-5] However, the estimation of the decrease of body temperature is still the most reliable method used, supplemented by the others thanatochronological criteria.[6]

In some cases, toxicology can help pathologists to better define the PMI; in fact, when the time of consumption is known, it is possible to estimate the time elapsed since the consumption of a substance by its concentration in blood and tissues.[7]

This work is about a case of cocaine-related-death, in which the definition of a precise PMI, obtained by the concurrence of thanatochronological and toxicological data, had a fundamental role in substantiating the failure-to-provide-assistance hypothesis.

The Case: A 47-year-old man was found dead at 6:30 p.m. in a hotel room, where he arrived with his girlfriend around 3:30 a.m.–4:00 a.m. of the same day. The woman reported the man took intravenous cocaine first around 1:00 a.m. when they were in another place, and then a second time in the hotel room, approximately between 4:00 a.m.–5:30 a.m. During the first interrogation performed by the police, she said she left the room at 5:30 a.m. while the man was sleeping; then she said she went back to the hotel around 12.00 a.m. to bring him home, but he preferred to stay, so she left again and never came back. This reconstruction of the facts was denied by the hotel keeper's witness, who reported that the woman definitely left the room around 12:00 a.m. At this point, the woman gave another version of the story; she said she left the hotel at 1:00 p.m. and her boyfriend was still alive.

The judicial authority supposed the man had died in a timeframe incompatible with the woman's story, so the hypothesis of failure-to-provide assistance took place. The thanatochronological data (obtained during the inspection at 8:30 p.m.: body temperature 31.0°C/87.8°F, room temperature 19.3°C/66.74°F) placed the time of death around 9:30 a.m.; the Henssge nomogram (corrective factor: 1) was used. The autopsy didn't reveal any concomitant disease or traumatic lesions able to justify the death, except for a sign of needle puncture at the right groin.

To assess the cause of death, toxicological analyses were performed and the cocaine and benzoylecgonine levels in the blood (446ng/ml and 8,427ng/ml, respectively), brain (0.51ng/mg and 1.56ng/mg, respectively), and liver (0.05ng/mg and 3.48ng/mg, respectively) confirmed cocaine overdose as the cause of death. The toxicological data were also used to estimate the PMI. The blood, brain, and liver cocaine/benzoylecgonine ratio (0.05, 0.33 and 0.014, respectively) and the brain/blood cocaine ratio (1.14) placed the death around 4–6 hours after cocaine injection. This chronological reference perfectly matched with thanatochronological information.

This case represents an example of how the classic thanatochronological data could be integrated with toxicological analysis to estimate the time since death, if the time since the last intake of the substance of interest is known. This could be a different approach for solving the historical issue of the evaluation of PMI.

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