H129 Triangulating Time-of-Death With CT Scan, Immunohistochemistry, and Autopsy: An Experimental Study on Murder Case Investigations

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After attending this presentation, attendees will understand how forensic methodology on estimation of time-of-death can be implemented with new technologies and how a correct procedure may solve a case in less than 24 hours.

This presentation will impact the forensic science community by presenting a multidisciplinary approach (forensic pathology, forensic radiology, and forensic histopathology) to the everlasting problem of the chronological assessment of a murder case.

This study presents an unusual murder case where the classic measurements to determine the chronological estimation of death did not agree with the Computed Tomography (CT) scan made of the victim's body. In this case, the use of a CT scan was crucial for the exact estimation of time of death which was a new use of this technology in the forensic examination. The autopsy led to the identification of the murder weapon, thus narrowing the list of suspects and leading to an arrest and a confession by the murderer. Additionally, the immunohistochemistry confirmed a suggested hypothesis that matched the murderer's confession. In this specific case, a discrepancy was detected between the time of the reported attacker's crime and the body temperature of the discovered corpse. In fact, according to these reports, the crime would have to have been accomplished later than suspected and at a time when the suspect was seen in another place. The examination of CT images acquired before the autopsy was performed made it possible to highlight a hemorrhage in the cerebral ventricles that appeared organized, making it possible to chronologically characterize the hemorrhage and determine the time of death. Immunohistochemical staining on skin lesions was also performed to verify the viability and, where possible, the time of production. The comparison between the state of the cerebral hemorrhage and vital reactions, highlighted by immunohistochemical investigations, made it possible to demonstrate that the lesions were produced in a period preceding the time of death determined by traditional forensic thanatology phenomena. The condition of the cerebral hemorrhage and the evolution of the inflammatory phenomena shown by immunohistochemistry allowed tracing the injuries to before the time indicated by the state of rigor mortis and rectal temperature. This data established that the dating of the injuries (and thus the attack) was made at a time when the suspect did not have an alibi. Thanks to the examination of these images and immunohistochemical preparations, it was possible to assume that the victim had not died immediately after the attack but had remained in agony for many hours. This justified the discrepancy between the body temperature at the time of examination and the actual time of the assault. This case shows the possibility of using the forensic radiology, possibly together with the immunohistochemical reactions, to evaluate the state of the injuries and the determination of the time of death.

In conclusion, this study clarifies how the support of a multidisciplinary approach to murder cases, using all the tools available to the forensic examiner, are crucial for a correct legal and medical methodology and, of course, the arrest of criminal suspects.

Time-of-Death Estimation, Immunohistochemistry, CT Scan