



H127 An Evaluation of Cardiac Implantable Electronic Devices in Forensic Practice: How It Can Improve the Medicolegal Analysis of Cause of Death in Postmortem Analysis and Even Answer Unexpected Questions in the Living

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Learning Overview: After attending this presentation, attendees will better understand various situations for which the analysis of a pacemaker or a defibrillator device were useful in forensic practice.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting several case reports in which the pacemaker or defibrillator interrogation provided essential information to the forensic pathologist.

Introduction: Cardiac Implantable Electronic Devices (CIEDs) are commonly implanted in patients suffering from various heart conditions. They encompass Pacemakers (PM) and Implantable Cardioverter Defibrillators (ICDs). Most of the devices have an automatic cardiac rhythm recording feature, allowing it to be interrogated at any moment to provide important information for the patient's follow-up; but interrogation can also be made in a forensic context. Presented here are three cases in which analysis of CIEDs was useful in a routine manner.

Case 1: A 30-year-old male was found dead at home. He had attended a party the day before. The deceased had a history of third-degree atrioventricular block. He had a PM since the age of 20. During the autopsy, the cause of death could not be specified. Toxicology and histology were still pending while this abstract was being written. The PM analysis revealed that at 9:18 a.m. the morning of his death, a ventricular tachycardia followed by several minutes of ventricular fibrillation were recorded that did not allow survival. The estimated time of death given by the physician who delivered the death certificate was around 2:30 p.m. the same day. That was not consistent with the device data analysis.

Case 2: An 86-year-old male suffered from terminal heart failure. He had a history of ventricular arrhythmia and carried an ICD. He was brought to the emergency room because he had signs of acute decompensated heart failure. His family, who had recently decided with his physician to limit any invasive medical intervention, was not consulted and the patient was transferred to several departments before he died in the intensive care unit, 48 hours after his admission. During the autopsy, signs of severe cardiac heart failure were present and confirmed by histology. Toxicology showed a lethal concentration of digoxine, which was part of the regular treatment of the deceased. The question of a digoxin poisoning that could be partly due to error in prescription and/or in medication administration was asked by the family. First, the ICD analysis showed that the device ran properly. Second, no arrhythmic episode could be detected during the two days of hospitalization. As a high concentration of digoxin is not interpretable by itself if not correlated to cardiac arrhythmia, it was concluded that the cause of death could not be directly related to a digoxin poisoning but was due to terminal heart failure.

Case 3: A 45-year-old male, suffering from a Brugada syndrome with a mixed anxiety-depressive disorder, reported being the victim of verbal and physical assault within a six-month period by two individuals. As the physical violence was particularly severe, investigators wanted to know whether the ICD he was carrying for the cardiac condition had registered any abnormal activity and had delivered any electrical shock during the time of his sequestration. The patient's ICD was analyzed with his consent at the request of the investigators. The analysis showed that no abnormal cardiac activity had been recorded within the past two years prior to the complaint.

Discussion: The importance of CIED interrogation in a forensic context has already been described in the literature. This analysis can answer questions regarding the circumstances and the cause and manner of death. The first case was classic and provided an example of determining the last event before death. The second case was more unusual and contributed to the analysis of a medical malpractice case. Finally, the last case showed that CIEDs may also be interesting for a case with a living person. These three cases confirm forensic institutes should proceed with a systematic CIED interrogation for all individuals carrying these devices as they can provide important additional information to the medicolegal investigation.

Forensic Science, Forensic Pathology, Pacemaker