



Pathology/Biology Section - 2013

G167 A Unique Cause of Death in a Double Hot Tub Fatality: Electrocution by Implantable Cardioverter Defibrillator

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After attending this presentation, attendees will understand how to investigate deaths occurring in hot tubs and other closed environments, especially when more than one fatality occurs simultaneously. One must investigate all environmental hazards that might have impacted all of the victims.

This presentation will impact the forensic science community by exposing an environmental hazard that has not been previously reported to cause death.

Although deaths in hot tubs are not an infrequent occurrence, deaths of two or more people in a hot tub or any other closed environment raises suspicion that an external hazard has caused the deaths of these victims. Hazards include electrocution by faulty wiring or equipment, drugs, extreme temperatures, homicidal violence, and poisons such as carbon monoxide in the breathing environment. Examination of the surrounding environment in which the deaths occur as well as the equipment involved is vital in determining the cause of death. Full autopsies with postmortem toxicology are also necessary in determining the cause of death. Identifying hazards in an environment will also enable the removal of hazards and the prevention of further deaths and injuries.

Implantable cardioverter defibrillators are considered life-saving devices because of their ability to detect and then treat ventricular fibrillation by shocking the heart back into sinus rhythm. However, little is known about the effects of these shocks on other people in contact with these patients when their ICDs fire. In certain situations, it is probably hazardous to have skin-to-skin contact with people who are being shocked by their ICDs.

The case presented is that of two elderly people, a husband and wife, who had a daily habit of sitting in their hot tub and were found dead there by neighbors. Both decedents had a history of heart disease. Examination of the scene revealed the hot tub to be in an open area on the lanai behind their house. Inspection of the wiring and the equipment by medical examiner investigators, an electrical inspector, and an expert hired by the next of kin revealed no electrical hazards. The autopsies of the two decedents showed no injuries and both had severe heart disease. Toxicological studies of both victims were negative. At autopsy, the female decedent was found to have an implantable cardioverter defibrillator. It was removed and submitted for query. The query revealed that the woman developed ventricular fibrillation, and, over a short period of time, her ICD delivered four separate shocks without producing cardioversion. No external source of electrical current was detected by the ICD.

Based on the autopsy, circumstances, and scene investigation, it is the opinion that the cause of death of the woman was ventricular fibrillation due to her underlying heart disease. Since it is unlikely that the husband also died of natural causes simultaneously, it is also the opinion that the husband died from electrocution from his wife's ICD while trying to rescue her. Being in water containing an electrolyte solution greatly reduced the electrical resistance of skin-to-skin contact, making a shock from an ICD more hazardous.

In summary, the investigations of deaths occurring in hot tubs require full autopsies and toxicology along with examination of the environment and inspection of the equipment in use at the time of death. In cases involving ICDs, the device should be queried. People in contact with patients with these devices should be aware that they can also receive shocks that can be fatal in some circumstances.

ICD, Electrocution, Hot Tub