

# The relevance of postmortem cardiac implantable electronic device interrogation

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## RELATED ARTICLE

by Tajstra et al,  
see p. 492

Cardiac implantable electronic devices (CIEDs) encompass pacemakers for antibradycardia pacing, implantable cardioverter-defibrillators for tachyarrhythmia treatment, and cardiac resynchronization therapy devices for heart failure management. After CIED implantation, a continuous follow-up is necessary, either through in-person visits or using remote monitoring.<sup>1,2</sup> Up to 16% of the patients with CIEDs still die of sudden arrhythmia-related events.<sup>3-5</sup>

Only a few studies on postmortem interrogation have been conducted so far, and these are still not performed routinely. Postmortem interrogations have been proven to help gather useful information about the time and cause of death, also in ruling out device dysfunction.

In the current issue of *Polish Archives of Internal Medicine (Pol Arch Intern Med)*, Tajstra et al<sup>6</sup> analyzed the postmortem interrogations of 61 CIEDs and combined them with clinical data from the time of device implantation, patients' last hospitalization, and autopsy findings. It should be noted that the study population presented with severely advanced cardiovascular disease already at the time of device implantation (with the mean left ventricular ejection fraction of 19.6%). At last hospitalization, two thirds of the patients were hospitalized for heart failure decompensation and a half of all patients required mechanical circulatory support. During the postmortem interrogation, no unsuccessful pacing could be identified, and all ventricular arrhythmias were found to be successfully terminated. However, the authors identified 6 possible CIED-related events (9.8%), which could have played a role in patients' deterioration and contribute to their death, such as loss of left ventricular capture, unsuccessful ICD shocks prior to death, and occurrence of electrical storms.

In general, in almost one third of the cases, the exact cause or time of death could not have been determined. With postmortem device interrogation, not only these cases can be confirmed

but also further important etiologies can be revealed, such as device malfunctions (eg, ventricular fibrillation undersensing, lead fractures, or even programming issues). This information might have clinical consequences regarding device programming in other patients or in the case when a dysfunction has been revealed in a device series.

The relevance of postmortem interrogations was also shown in previous studies, which investigated the importance and feasibility of these analyses. Similar to the recent study by Tajstra et al,<sup>6</sup> a total of 151 implanted CIEDs were investigated by Lacour et al.<sup>7</sup> In that study, on autopsy, time of death could not be determined in 26.7% of patients and cause of death in 34%. The postmortem interrogations helped the researchers to indicate time of death in 70% of patients and cause of death in 61%. In that study cohort, device concerns occurred in 6% of patients and included hardware, programming, and algorithm issues.<sup>7</sup>

Riesinger et al<sup>8</sup> analyzed 70 CIED interrogations after patients' death and a cardiac cause of death was identified in 17 cases (24%), in 8.6% of which ventricular arrhythmias could be detected.

In a relatively long-term study with a 35-month inclusion period, 22 patients with CIEDs who died of sudden cardiac death were identified.<sup>9</sup> A non-cardiac cause of death was established on autopsy in 6 patients, and 59% of the patients died of ventricular tachycardia or fibrillation. In that cohort, 6 patients had pacemakers, and 7 patients used implantable cardioverter-defibrillators. In this small patient group, device concerns could be determined in 50% of cases, hardware issues were detected in 3 devices, and ventricular arrhythmias were undersensed and assessed to be the exact cause of sudden cardiac death in 5 patients.<sup>9</sup>

Sinha et al<sup>10</sup> studied postmortem CIED interrogations in 84 patients and investigated clinically significant cardiac alerts such as sustained atrial or ventricular tachyarrhythmias within 24 hours before death, or elevated fluid or volume

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overload values suggestive of high intrathoracic impedance. These investigations revealed relevant clinical findings, particularly in cases of sudden death. Alerts were noted more frequently in patients with a defibrillator and in those in whom a cardiac cause of death was found.

As stated in the published articles, CIED interrogation after patients' death helps to determine the exact time, cause, and mechanism of death. Although all conducted studies confirm its benefit and agree on the necessity of postmortem CIED interrogation, this modality has not been implemented into routine practice yet. Nevertheless, these results can also highlight the relevance of remote monitoring in patients in whom a strict clinical follow-up has certain limitations. It can be a potential option to avoid sudden cardiac death or to detect abnormalities in time.

## ARTICLE INFORMATION

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