

PROCEEDINGS

American Academy of Forensic Sciences

75th Anniversary Conference



Science Works

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PROCEEDINGS
of the American Academy of Forensic Sciences 75th Anniversary Scientific Conference

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152 Death From an Unexpected Superior Venous Laceration During the Implantation of a Leadless Intracardiac Pacemaker: The Role of the Forensic Pathologist

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Learning Objective: After attending this presentation, attendees will be able to identify unpredictable adverse events of medical procedures such as the implantation of a leadless intracardiac pacemaker.

Impact Statement: This presentation will impact the forensic science community by providing relevant information to recognize iatrogenic lethal complications in the leadless pacemaker positioning procedure.

Each year, nearly one million people worldwide receive conventional cardiac pacemakers to treat bradycardia and heart block. Traditional pacemaker-related adverse events occur in 1 out of 10 patients; they are typically related to pulse-carrying transvenous leads that can dislodge, cause infection or venous occlusion.¹ To overcome these problems, leadless pacemakers were designed. These latest 1ml devices contain a battery, pulse generator, and electrodes and are delivered by femoral vein catheter with a non-surgical and mini-invasive implantation at the apex of the right ventricle through the inferior vena cava.² The indications for a leadless intracardiac pacemaker are predominantly permanent atrial tachyarrhythmia and atrioventricular block. According to the latest scientific literature data, the leadless pacemaker implantation has a low risk of adverse events such as cardiac wall perforation, pericardial effusion, and infections.³

A 79-year-old woman with a history of hypertension, diabetes, COPD, renal failure, and overweight was admitted to the hospital for multiple syncopal episodes with an accidental fall occurring the day before. Medical examinations resulted in a second-degree Type 2 atrio-ventricular block with severe aortic and mitral stenosis. The patient had a history of previous bacterial endocarditis and a right calcific fibrothorax with ipsilateral hemithorax retraction associated with pulmonary hypoventilation. Considering the symptomatic atrio-ventricular block and the previous endocarditis, six days after the admission she was submitted to the percutaneously implantation of a leadless intracardiac pacemaker. During the operation, the patient manifested unexpected cardiac tamponade. Despite medical assistance and the execution of pericardiocentesis, the patient was declared dead after a cardiorespiratory arrest unresponsive to advanced resuscitative support maneuvers. To figure out the cause of the sudden cardiac tamponade and in the suspicion of medical malpractice, the local prosecutor ordered an autopsy. The thanato-chronological parameters were coherent with the circumstantial historical data. The autopsy showed multiple rib fractures on both sides as results of resuscitation attempts, several calcific right pleural adhesions, and a focal blood clot in the pericardial cavity. The heart weighed 730g. The heart examination revealed a hematoma about 3cm in diameter surrounding a laceration of the intrapericardial superior vena cava, and a 4mm linear injury on the outer surface of the right ventricle not communicating with the cardiac cavity. The histopathological examination confirmed the presence of a full-thickness traumatic interruption of the superior vena cava with evidence of a de-lamination. The autopic and histological findings, integrated with the clinical records data, reconducted the cause of death to a cardiac tamponade resulting from the iatrogenic laceration of the superior vena cava during the leadless pacemaker implantation.

In the present case, the superior vena cava was accidentally lacerated during the preliminary procedures of the catheter placement. Since there are no current guidelines or a practice advisory in the perioperative management of this atypical, injured site, it was classified as an unexpected adverse event.³ It was also an unpredictable event because of the right calcific fibrothorax that caused a partial distortion of the superior vena cava root along with an increased vulnerability to traction. The matching between antemortem medical records and autopsy findings was crucial in the determination of the manner of the death. According to the results, the judge for preliminary investigations closed the case as accidental death that occurred due to complications of invasive and therapeutic procedures.

References:

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2. Phillips, R. Device therapy: Leadless pacemaker demonstrates safety, efficacy, and retrievability. *Nat Rev Cardiol.* 2015 Nov;12(11):620.
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Leadless Intracardiac Pacemaker; Unexpected Iatrogenic Event; Forensic Pathology