

Developing a crush: acute implantable cardioverter-defibrillator lead insulation break in a patient with multiple leads

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A 71-year-old man had his dual-chamber pacemaker upgraded to a cardiac resynchronization defibrillator. At 6 weeks, he presented with falls. Left arm elevation precipitated dizziness and ventricular standstill. The extracted defibrillator lead showed extensive insulation damage. This case illustrates an acute crush injury in a physically inactive patient with multiple leads in the subclavian vein.

A 71-year-old man with ischaemic cardiomyopathy had a dual-chamber pacemaker inserted via the subclavian vein for complete heart block. The patient was 100% ventricularly paced.

He presented 9 years later in New York Heart Association III. He was upgraded to a biventricular defibrillator. An atrial 52 cm St Jude/Tendril ST Optim IS1 lead, right ventricular 58 cm dual-coil active-fixation St Jude Durata DF4 lead, and left ventricular 86 cm St Jude Quartet IS4 lead were sited via the subclavian vein, with a St Jude Unify Quadra generator. The old (unipolar) atrial and ventricular leads were cut and buried.

Six weeks later, the patient presented with falls, and dizziness on elevating his left arm. Cardiac monitoring revealed ventricular standstill during this manoeuvre. The defibrillator lead was explanted manually and found to have extensive insulation damage (see Figure 1). The old right ventricular and atrial leads were also explanted, and a new St Jude 7120Q Durata defibrillator lead implanted.

Discussion

This case illustrates an acute defibrillator lead crush injury, leading to an insulation break and noise inhibition of pacing. It is unusual because the damage occurred so soon after implant, and this patient with advanced heart failure led a very sedentary lifestyle. Anecdotally, physically active patients are most likely to experience subclavian crush.

Subclavian crush injury is well recognized. Examination of 49 cadavers, who had compressed pacing leads placed via the subclavian vein, demonstrated a significant increase in pressures generated in the costoclavicular angle compared with a more lateral subclavian or cephalic puncture.¹



Figure 1 Explanted defibrillator lead showing insulation break.

This patient had five leads in his subclavian vein, which may have contributed to lead compression. There is currently no strong evidence to extract abandoned leads. In a study of 433 patients with 531 retained, non-functioning pacing leads venous occlusion was found in 16, of which only 7 required lead extraction. Increasing number of abandoned and total leads and younger age at implant were correlated.² However, in the recently published Heart Rhythm Society consensus statement on lead extraction, the case presented would receive a class IIa, evidence level C indication for extraction (more than four leads in the subclavian vein).³ Extraction of the non-functioning leads should thus have been considered during the original upgrade procedure.

Lead crush may result in an adverse outcome; this patient was pacing dependent, and hence became symptomatic during pacing inhibition due to oversensing. In the case of a defibrillator lead, undersensing could lead to equally serious consequences. In one study of defibrillator lead failure, one patient experienced a crush injury which led to undersensing of true ventricular fibrillation.⁴

In summary, this patient developed a compromising lead crush which may have resulted from a medial puncture to a subclavian vein which already contained three leads. As device implantation rates increase and patients with devices live longer, it is likely that more leads will be implanted. When using the subclavian route, care should be taken to avoid a very medial puncture, lead extraction should be considered early, and regular follow-up is required to minimize the potentially serious consequences of lead failure. Finally, the finding of multiple leads predisposing to lead crush needs to be validated in a large clinical cohort study.

Conflict of interest: none declared.

References

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