

A rare case of acute myocardial infarction during extraction of a septally placed implantable cardioverter-defibrillator lead



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Introduction

Over the last decade there has been an increasing number of implantations of implantable cardioverter-defibrillator (ICD) devices, especially for the primary prevention of

cardiac arrhythmic death. The increased number of implantations has also generated a rise in the number of lead extraction procedures, mostly because of device-related infections, with an estimated 10,000 to 15,000 extractions

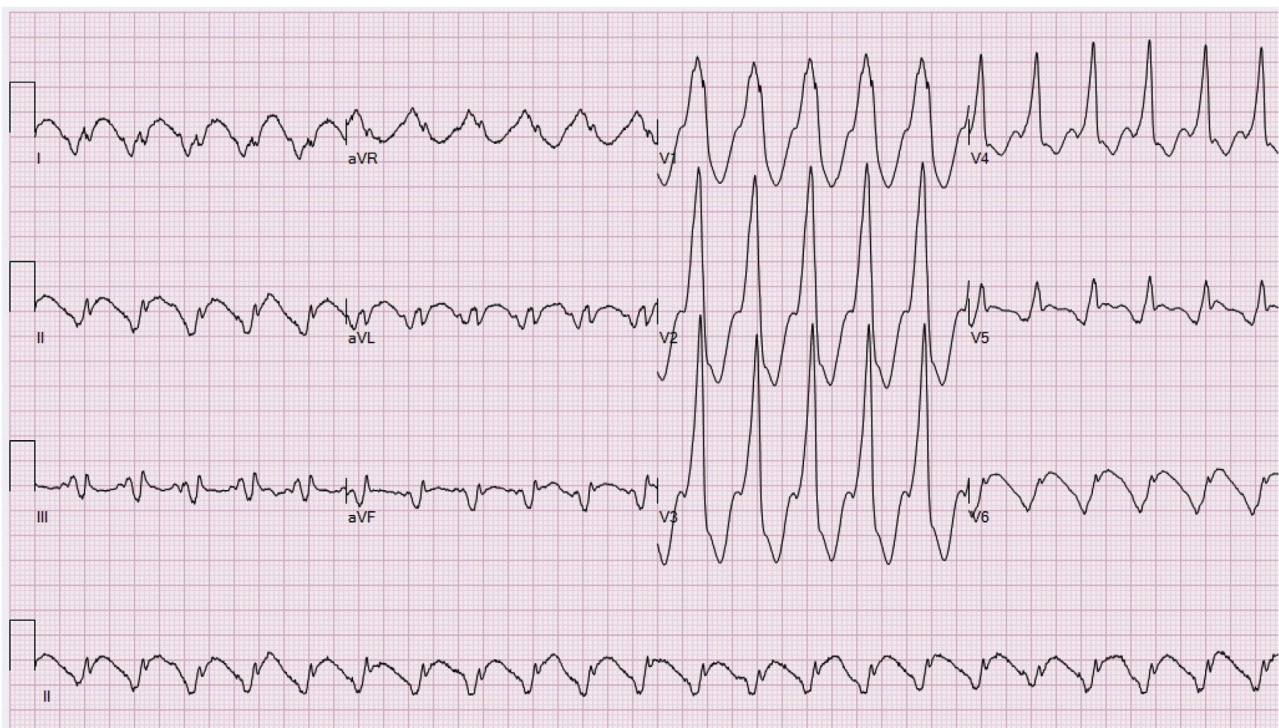


Figure 1 Electrocardiogram on presentation showing ventricular tachycardia, heart rate of 155 beats/min, with right bundle branch morphology and superior axis.

KEYWORDS Acute myocardial infarction; Coronary artery; ICD; Left anterior descending coronary artery; Perforation; Shock lead (Heart Rhythm Case Reports 2018;4:127–129)

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per year worldwide.¹ Lead extraction is performed in most patients without difficulty. However, major complications such as pulmonary embolism, bleeding, cardiac perforations, vascular tear, pneumothorax, and infections are seen in 2%–3% of patients.² We report a rare case of acute myocardial infarction during extraction of a septally placed ICD lead.

KEY TEACHING POINTS

- Injury to the coronary arteries during lead extraction is very rare; mostly the left anterior descending (LAD) coronary artery is injured.
- Using 2-dimensional fluoroscopy, the proximity of lead tips to coronary arteries is not always appreciated. Research showed that the majority of “septally” placed lead tips were on the right ventricular anteroseptal junction near the course of the LAD coronary artery.
- We make a plea for a careful examination of coronary anatomy by computed tomography angiography or coronary angiography before lead extraction or repositioning, especially in the case of septal placements of leads.

Case report

A 59-year-old male patient with known inferoposterolateral myocardial infarction at the age of 38 (treated with thrombolysis) was seen at our outpatient clinic for periodic follow-up after ICD implantation. In 2000 percutaneous coronary intervention (PCI) of the right coronary artery (RCA) and right circumflex coronary artery (RCx) was performed. Echocardiography revealed a poor systolic left ventricular (LV) function. In 2011 a single-chamber ICD (Boston Scientific) was implanted, with the Endotak Reliance defibrillation lead (Boston Scientific Corp., Marlborough, MA) placed in the high right ventricular septum, for primary prevention.

The patient was transferred to our hospital after cardiac arrest during an afternoon run. Basic life support was initiated by bystanders and he received multiple ICD shocks without return of circulation and was rushed to the hospital. An in-hospital electrocardiogram showed a ventricular tachycardia (VT) of 155 beats/min with a right bundle branch morphology and superior axis (Figure 1), which was terminated with external cardioversion after a bolus of 150 mg intravenous amiodarone. ICD interrogation showed multiple VT episodes with 20 appropriate unsuccessful shocks and 2 unsuccessful antitachycardia pacing episodes at the time of out-of-hospital cardiac arrest. Furthermore, the interrogation revealed a sudden decrease in the shock lead sensing (from 23 mV to 9.6 mV) and a sudden drop in shock lead impedance (from 550 ohms to 400 ohms with a pacing threshold rise to 2.8 V at 0.6 ms) 2 weeks before this current event.

To exclude an ischemic trigger for the VT, coronary angiography was performed, which revealed significant 3-vessel coronary artery disease (proximal left anterior descending [LAD], mid RCx, and distal RCA), and complete revascularization was performed with PCI. On the second day of hospitalization, the patient developed a relapse of the clinical VT that was hemodynamically well

tolerated. The VT did not terminate after intravenous procainamide. It was decided to perform an emergency VT ablation and to implant a new shock lead and extract the malfunctioning shock lead.

After exclusion of an LV thrombus, a successful VT catheter ablation was performed under general anesthesia using remote magnetic navigation (Stereotaxis Inc., St Louis, MO). The endpoint, noninducibility of clinical VT, was reached. Before extraction, a venography showed a normal course of the left axillary and subclavian vein to the vena cava superior. During controlled traction acute hypotension occurred, along with ST elevation in the anterolateral and inferior leads on electrocardiography. No pericardial effusion was seen on transesophageal echocardiography. No further attempts were made to extract and the dysfunctional shock lead was left in situ. A new shock lead was placed in the apex of the right ventricle and was connected to a new device. Emergency coronary angiography showed an occlusion of the mid LAD at the site of the old septal shock lead helix (Figure 2, Video 1). An attempt to open the coronary artery was unsuccessful, possibly owing to perforation of the helix of the shock lead.

In retrospect, near-proximity, interference, and coronary spasm in the mid-LAD by the old ICD shock lead helix was already seen at the initial angiogram (Figure 3, Video 2). A maximum CK-MB of 107 units/L (normal < 7.6) and maximum troponin T of 0.105 mcg/IU (normal < 0.015) was observed. During hospital stay there were no further complications. During a follow-up of 12 months there were no VT recurrences.

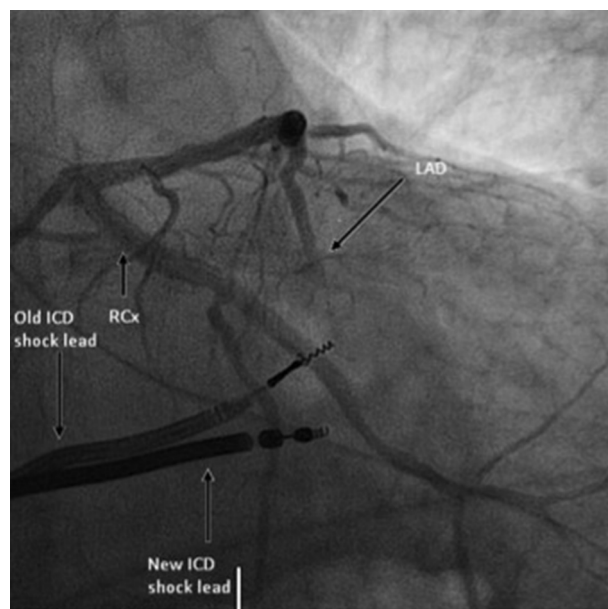


Figure 2 Coronary angiography performed during anterolateral myocardial infarction after unsuccessful lead extraction, showing perforation of the mid left anterior descending coronary artery (LAD) by a screw perforation of the old shock lead helix (new shock lead also visible) (caudal view). ICD = implantable cardioverter-defibrillator; RCx = right circumflex coronary artery.

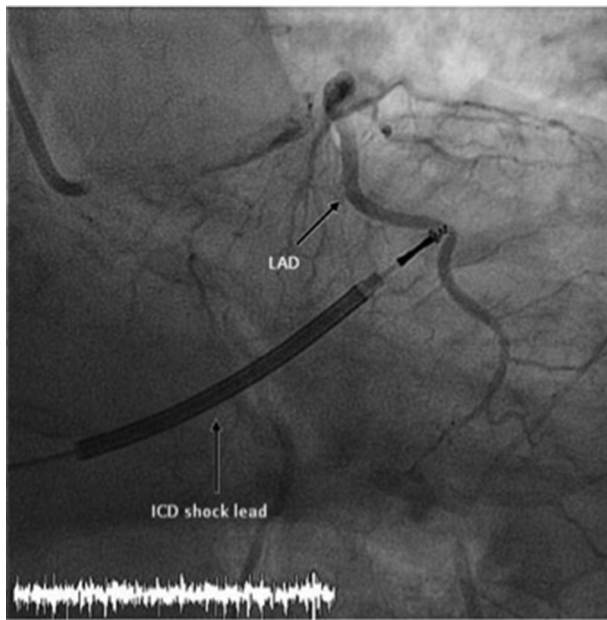


Figure 3 First coronary angiogram during hospitalization reveals near-proximity, interference, and coronary spasm in the mid left anterior descending coronary artery (LAD) by the implantable cardioverter-defibrillator (ICD) shock lead helix (caudal view).

Discussion

We present a rare case of an acute anterolateral myocardial infarction during lead extraction of an ICD shock lead.

In general, possible indications for lead removal are device-related infections, thrombotic complications, and possible nonfunctional leads.³ Most leads can be extracted using a traction-and-counterclockwise-rotation approach. The use of traction tools or laser sheaths is reserved for a second-line approach. In our case, an attempt was made to extract the old shock lead and to replace it with a new shock lead, because of unsuccessful ICD shocks and abnormal sensing and impedance measurements.

Injury to the coronary arteries during lead extraction is very rare. Three previous cases have been published that describe lead placement leading to injury of the LAD coronary artery.^{4–6} One of the cases led to perforation of the LAD by the lead helix and was treated by removal and placement of a covered stent⁶; the 2 other cases led to local

coronary spasm owing to direct contact and were treated by lead removal and placement of a drug-eluting coronary stent⁴ and by repositioning of the lead.⁵

Using 2-dimensional fluoroscopy for the implantation of cardiac implantable electronic device leads, the proximity of lead tips to coronary arteries is not always appreciated. A recent analysis compared the estimated lead placement with actual location on computed tomography (CT), with noteworthy results. The majority of “septally” placed lead tips were instead on the right ventricular anteroseptal junction, where the LAD runs in the interventricular groove.⁷

A concealed perforation of the LAD should be considered when new-onset abnormal RV lead measurements or recurrent VT are present in a septally placed RV lead. We plead for a careful examination of coronary anatomy by CT angiography or coronary angiography before lead extraction or repositioning, especially in the case of septal placement of leads.

Appendix Supplementary data

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.hrcr.2017.11.001>.

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