Life-threatening perforation of a defibrillation lead

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We describe cardiac perforation of a Riata implantable cardioverter defibrillator (ICD) shock lead in a 76-year-old male nine days after implantation of a prophylactic ICD. Since there are more reports of increased risk of cardiac perforations with the Riata lead, we advise cautious use of this lead. (*Neth Heart J* 2009;17:113-4.)

Keywords: cardiac shock, implantable cardioverter defibrillator (ICD), lead perforation

Although the occurrence of complications of implantable cardioverter defibrillator (ICD) implantation is low, there have recently been several reports of cardiac perforations of the Riata lead.^{1,2} We, too, describe cardiac perforation with this lead in one of our patients.

Case

A 76-year-old man with ischaemic dilated cardiomyopathy, left ventricular ejection fraction of 20% and previous percutaneous coronary intervention (PCI) underwent a prophylactic transvenous ICD implantation in February 2008. The right-sided single chamber ICD was successfully implanted (Atlas II VR V-168), with transvenous endocardial active fixation of the single coil lead (Riata 7002, length: 65 cm, dm 7 French, serial number: SN 00ABH25663, St. Jude Medical system, Sylmar CA, USA) in the right ventricular apex. The peroperative pacing threshold was 0.7 V, R wave amplitude 23.7 mV and pacing electrode impedance 697 Ohm. There was no diaphragm

stimulation with maximal output of the RV pacing electrode. Twenty-four hours postimplantation, routine chest X-ray showed no signs of pneumothorax or pleural or pericardial effusion. The tip of the lead was positioned near the right ventricular apex. The lead parameters remained stable at the time of discharge. The patient was discharged on optimal medication, including coumarin, dipyridamole, bumetanide, spironolactone, carvedilol, lisinopril and atorvastatin. Four days after implantation the patient was readmitted because of lateral chest pain. There were no abnormalities on the chest X-ray, ECG and echocardiography, and there were normal pacing and sensing parameters. Auscultation revealed a pericardial friction rub and the patient was admitted with suspected pericarditis. However, four days after admission, he suddenly developed more chest pain and became hypotensive. Interrogation of the ICD revealed malfunction of the RV lead with a decline in R wave amplitude (5.3 mV) and pacing electrode impedance (285 Ohm) and there was no RV capture at maximum pacing output. Echocardiography at that moment revealed pericardial effusion and right ventricular lead perforation (figure 1). Emergency surgical exploration was performed with median sternotomy. A perforation was found in the right ventricular apex 3 cm from the lateral side of the left anterior descending artery. The ICD generator and perforated RV lead were removed, with drainage of 800 ml blood and thrombotic material from the pericardium. The patient recovered without any events and was discharged after eight days. He refused implantation of an ICD in the future.

Discussion

Ventricular lead perforation is a serious complication of ICD leads, although in many cases the perforations are asymptomatic.³ Delayed lead perforation (migration and perforation after one month of implantation) ranges from 0.1 to 0.8% for pacemaker leads and 0.6 to 5.2% for implantable defibrillator leads.⁴ Also, lead perforation may occur more than one year after implantation.⁵

Echocardiography and X-ray are often sufficient to determine the diagnosis of lead perforation. Major

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Figure 1. Echocardiographic confirmation of right ventricular lead perforation, apical view.

risk factors for cardiac perforation are female gender, age, body mass index <20, anticoagulation therapy, use of steroids and leads with an extendable fixation helix.

Evolution of ICD leads has resulted in stiffer ventricular lead tips and thinner active fixation leads (i.e. the Riata lead). In our department a total of 276 Riata shock leads have been implanted, 125 of which were of the 7002-65 cm type.

With the Riata lead, the movement continues with every heartbeat and may protrude out into adjacent tissue, in some patients causing perforation.

Too much loop or tension on the lead will predispose to forward movement through the thinner right ventricular wall, particularly the apex.⁶ Another contributing factor may be the increasing prevalence of thinner, dilated ventricles with more impaired ventricular function.⁷

More cardiac perforations and lead revisions have been reported with the Riata lead.^{1,2,8} There was even concern about potential danger of the lead in the lay press.⁹ Positioning of the RV electrode in the right ventricular output tract along the septum may possibly decrease the risk of perforation. However, additional studies are necessary to demonstrate safety of this lead.

Conclusion

After ICD implantation one should be aware of lead perforation, particularly after use of the Riata ICD lead. Septal fixation of the lead may decrease the incidence of perforations. Additional postmarketing studies are mandatory to demonstrate (long-term) safety of this lead. ■

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