

Chest Pain Associated with Moderator Band Pacing

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A 65-year-old man was evaluated for chronic chest pain that had been present for 8 years after placement of a dual-chamber implantable cardioverter-defibrillator to treat inducible ventricular tachycardia. Previous coronary angiography had revealed nonobstructive coronary artery disease and a left ventricular ejection fraction of 0.45 to 0.50, consistent with mild idiopathic nonischemic cardiomyopathy. Evaluation with chest radiography and transthoracic echocardiography showed the implantable cardioverter-defibrillator lead to be embedded within the right ventricle at the moderator band, which had mild calcification. Treatment included extraction of the dual-coil lead and placement of a new single-coil right ventricular lead at the mid septum. The patient had complete relief of symptoms after the procedure. This case shows that chest pain can be associated with the placement of a right ventricular implantable cardioverter-defibrillator lead in the moderator band and that symptomatic relief can occur after percutaneous lead extraction and the implantation of a new right ventricular lead to the mid septal region. (*Tex Heart Inst J* 2014;41(5):551-3)

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Transvenous pacing with an implanted pacemaker has become the treatment of choice for cardiac rhythm disturbances such as sinus node dysfunction and complete heart block.¹⁻⁵ Transvenous pacing leads are inserted with fluoroscopic guidance and positioned in the right atrium and right ventricle (RV). In most patients, the right atrial appendage is the optimal location for the right atrial lead. However, the optimal position of the RV lead varies in accordance with RV anatomy (dimensions and orientation of the RV in the thorax), the presence of tricuspid regurgitation or cardiomyopathy, the patient's history of infarction, and the operator's experience. After pacemaker placement, ventricular cardiac pacing stimuli might cause acute or chronic chest pain, which usually is associated with cardiac perforation that requires emergency evaluation and treatment.⁶

We treated a patient who had chronic chest pain associated with placement of the RV lead in a calcified moderator band. We discuss the treatment and results.

Case Report

A 65-year-old man was evaluated because of chronic chest pain. His medical history included inducible ventricular tachycardia, which had been treated 8 years earlier with a dual-chamber implantable cardioverter-defibrillator (ICD). The right atrial lead was model 4470, and the RV lead was model 0185 of the ENDOTAK RELIANCE[®] G (Boston Scientific Corporation; Natick, Mass).

At the time of ICD implantation, the patient had been treated with sotalol; a coronary angiogram had shown nonobstructive coronary artery disease and a left ventricular ejection fraction of 0.45 to 0.50, consistent with mild idiopathic nonischemic cardiomyopathy. The chest pain had begun after implantation of the ICD and had persisted until his current presentation, 8 years later. The patient's medical history was also notable for hypertension, severe emphysematous chronic obstructive pulmonary disease, esophageal stricture (previously treated with dilation), and stroke. His body mass index was 23 kg/m².

We determined that the patient needed elective replacement of the ICD generator. He reported a chronic poking sensation in the chest, which was reproduced at the minimum RV pacing threshold, but not by manipulating the ICD pulse-generator pocket. He tolerated atrial pacing well and had no chest pain during high-rate atrial pacing. There was normal lead-integrity response to both left pectoral muscle isomet-

ric movement and left-arm isotonic maneuvers. Chest radiographs and transthoracic echocardiograms showed the ICD lead within the RV at the moderator band, which had mild calcification; there was no pericardial effusion (Fig. 1). Laboratory studies yielded normal results for electrolytes, renal function, and liver function. The hematocrit was 38% (normal range, 42%–52%), and the platelet count was $179 \times 10^9/L$ (normal range, $130\text{--}400 \times 10^9/L$). The electrocardiogram showed atrial pacing and ventricular sensing with right bundle branch block, left anterior fascicular block, and prolonged QRS complex duration (124 ms) (Fig. 2). Despite the Q waves and T-wave inversions in leads II, III, and aVF (Fig. 2), evaluation with stress myocardial perfusion imaging showed no evidence of an old inferior myocardial infarction, and the coronary angiogram was unchanged from the previous finding (8 years before) of nonobstructive disease.

The patient was treated by extracting (percutaneously) the dual-coil ICD lead with a CVX-300® Excimer Laser System (The Spectranetics Corporation; Colorado Springs, Colo) and replacing the ICD pulse generator. After successful lead extraction, we used the laser sheath to maintain vascular access and implanted a new single-coil Durata™ 7122Q right ventricular ICD lead (St. Jude Medical, Inc.; St. Paul, Minn) at the mid septum (capture threshold, 0.75 V; pulse width, 0.4 ms; measured impedance, 680 ohms; and R-wave amplitude, 12 mV) (Fig. 3). The chronic atrial lead pacing and sensing were unchanged.

The patient had complete relief of symptoms after the procedure. Defibrillation threshold testing after lead replacement was successful (threshold, 14 J; shock impedance, 62 ohms; and charge time, 6.2 s).

Discussion

The patient whose case we present had chest pain associated with an ICD lead implanted at the moderator band of the RV. Our literature review did not uncover any previous reports of this condition. Chest radiography and echocardiography excluded the diagnosis of cardiac perforation in this patient. We performed lead extraction in order to minimize the risk of other complications related to an abandoned ICD lead, such as lead-to-lead interaction, infection from an abandoned lead, venous thrombosis, or superior vena cava syndrome. In addition, lead extraction was recommended because of the possible risk of continued nerve stimulation from an abandoned lead during ventricular systole.

In this patient, pacing at the RV moderator band (also known as the septomarginal trabecula) resulted in reproducible, intolerable chest pain at minimum capture threshold. The chest pain might have been caused by stimulation of nerve fibers at the moderator band.^{7,8} The right bundle branch of the cardiac conduction system

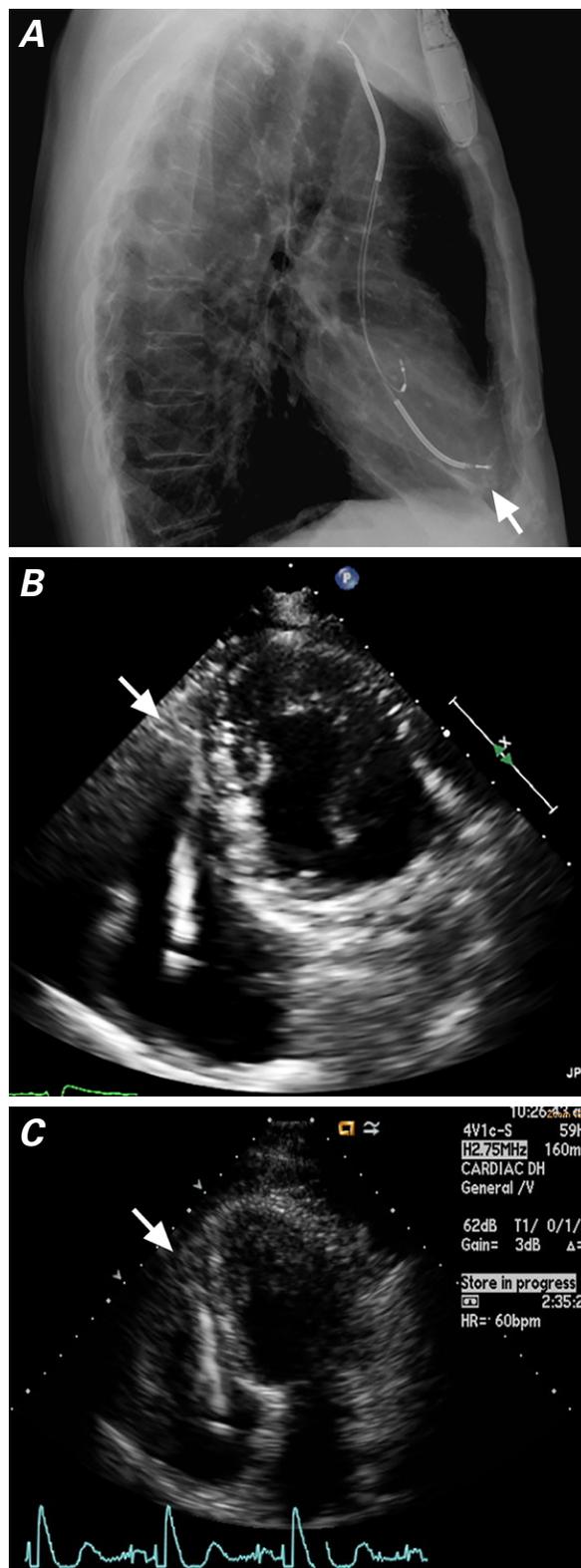


Fig. 1 **A)** Lateral chest radiograph shows the dual-coil implantable cardioverter-defibrillator lead (arrow) within the right ventricle and mild calcification of the moderator band. **B** and **C)** Transthoracic echocardiograms show that the moderator band has echogenicity caused by calcification and that the implantable cardioverter-defibrillator lead is in the moderator band (arrows) during right ventricular systole (**B**) and diastole (**C**).

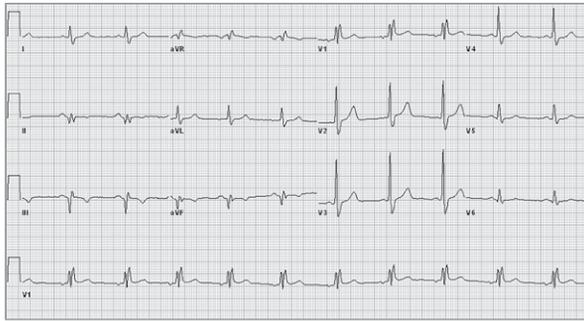


Fig. 2 Electrocardiogram shows atrial pacing and ventricular sensing with right bundle branch block, left anterior fascicular block, and prolonged duration (124 ms) of the QRS complex.



Fig. 3 Lateral chest radiograph after dual-coil lead extraction and single-coil lead replacement shows the single-coil lead in the mid septal region.

passes down the interventricular septum and through the moderator band to the base of the anterior papillary muscle. The right bundle branch does not emanate any branches until it reaches the base of the papillary muscle, and then it sends branches to the subendocardial plexus of Purkinje fibers, conus arteriosus, and free wall of the RV.⁹⁻¹¹ In many subjects (38%), the moderator band does not contain ordinary cardiac muscle but is purely a system of conductive tissue (Purkinje fibers and nerves).^{7,8} This particular patient responded well to lead removal from the moderator band region and had complete relief of symptoms.

This case shows that chest pain can be associated with the placement of a right ventricular implantable cardioverter-defibrillator lead in the moderator band and that symptomatic relief can occur after percutaneous lead extraction and the implantation of a new right ventricular lead to the mid septal region.

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