



A Progressive Prolapse of a Left Ventricular Pacing Lead into the Right Ventricle in a Patient with Cardiac Resynchronized Therapy

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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Case Study

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ABSTRACT

This case report illustrated a progressive prolapse of a left ventricular (LV) lead into the right ventricle and pulmonary artery for more than 2 years in a 33-year-old woman with a history of congestive heart failure secondary to nonischemic cardiomyopathy and left bundle branch block that underwent implantation of an implantable cardioverter defibrillator with cardiac resynchronized therapy. This phenomenon's mechanism might have been reverse reel or ratchet syndrome. This phenomenon could be missed because the LV lead tip was fixed with unchanged pacing measurements and the course of the thin LV lead could not be easily identified on chest radiographs.

Keywords: Cardiac resynchronized therapy; defibrillator; left ventricular lead; macrodislocation lead-dysfunctioning syndromes; prolapse.

1. INTRODUCTION

We describe a case with a progressive prolapse of a left ventricular (LV) lead

into the right ventricle and pulmonary artery for more than 2 years and discuss the mechanism of this phenomenon.

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2. CASE REPORT

A 33-year-old woman with a history of congestive heart failure secondary to nonischemic cardiomyopathy and left bundle branch block underwent an implantation of an implantable cardioverter defibrillator (ICD) with cardiac resynchronized therapy (CRT-D) (CD3231-40Q, St Jude Medical, Saint Paul, MN) (Fig. 1). Right atrial pacing and ICD leads were placed through the cephalic vein, and a left ventricular (LV) pacing lead (1258T-86, St Jude Medical) was placed through the axillary vein in the lateral branch of the coronary sinus. She had been followed up regularly, and the CRT-D had been functioning normally without any significant changes in the electrocardiograms or pacing measures. The impedance and pacing threshold of the LV lead ranged between 910 and 1150 ohms and 1.0 and 1.25 volts at 0.5 msec, respectively. She underwent an implantation of

an LV assist device 3 years after the CRT-D implantation, when the LV lead was found to have prolapsed looping into the pulmonary artery (Fig. 2). The chest radiographs were then reviewed, and it was found that the prolapse of the LV lead had started 4 months after the implantation, and progressed for more than 2 years (Figs. 1 and 2). An LV lead revision was performed, but the LV lead could not be pulled back, and was left in place.

3. DISCUSSION

In this case, the LV lead had progressively advanced into the heart for more than 2 years, and prolapsed looping into the pulmonary artery 3 years after the implantation of the CRT-D. It is known that there are 3 types of macrodislocation lead-dysfunctioning syndromes such as Reel, Twiddler's, and Ratchet syndromes [1-10]. Reel Syndrome occurs when the generator rotates

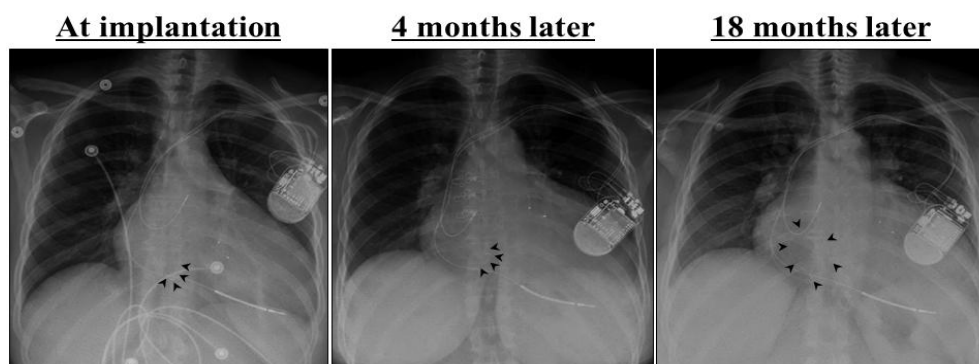


Fig. 1. Chest radiographs exhibiting a progressive prolapse of the left ventricular lead into the right ventricle

The arrowheads indicate the part of the left ventricular lead that prolapsed into the right ventricle

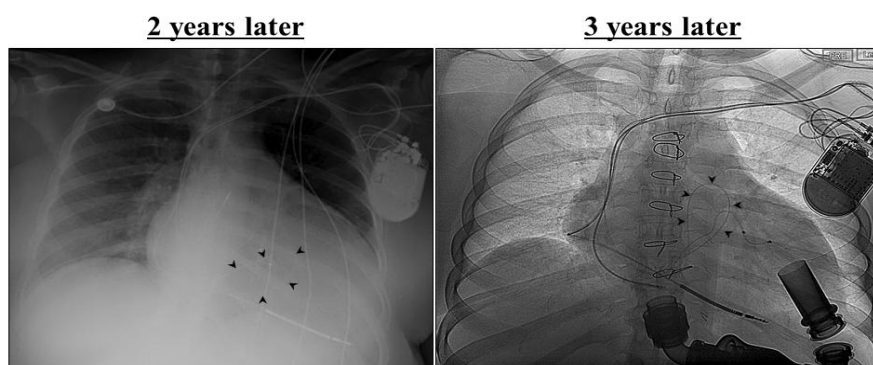


Fig. 2. A chest radiograph (left panel) and fluoroscopic image (right panel) exhibiting a progressive prolapse of the left ventricular lead into the right ventricle and pulmonary artery, respectively

The arrowheads indicate the part of the left ventricular lead that prolapsed into the right ventricle and pulmonary artery

around its sagittal axis, causing the electrode to roll up like a spool above or below the generator. Twiddler's syndrome is caused by retraction and dislocation of the electrodes due to rotation of the generator around the axis defined by the electrode. Ratchet syndrome is caused by retraction and electrode dislocation with ratcheting but without coiling of the generator due to progressive displacement of the electrodes from their fixing protections. All three of these syndromes cause dislodgement and withdrawal of the leads. In this case, only the LV lead had advanced into the heart with the other two leads remaining intact. The LV lead and the other leads were placed through different venous approaches, resulting in no interactions among the leads. In addition, the two leads placed through the cephalic vein were fixed firmly in the vein with a tie. Therefore, the mechanism of the phenomenon in this case might have been reverse reel or ratchet syndrome.

Reel and ratchet syndromes usually occur within a month, and can be found early [1]. However, in this case, the progressive prolapse of the LV lead into the heart was missed for a couple of years for several reasons. First, the tip of the LV lead was fixed with unchanged pacing measurements. Second, the run of the thin LV lead could not be easily identified on the chest radiographs.

This type of a pacemaker lead prolapse might cause some problems such as tricuspid regurgitation and ventricular arrhythmias induced by mechanical stimulation of the lead. Therefore, it should be detected as early as possible. Once it is detected, a lead revision should be performed as soon as possible. While the lead is moving with less scar tissue around it, it should be easy to pull the lead back to an appropriate position. As mentioned above, it was difficult to detect the LV lead prolapse in this case. In order to detect this type of a pacemaker lead prolapse early, chest radiographs should be read more carefully by not only looking at the location of the tip of the lead but also following the run of the lead. Routine fluoroscopic exams that can delineate a thin pacemaker lead more clearly than chest radiographs, may be considered during the early period after the implantation. Echocardiographic exams might be able to show a prolapsing lead in the right ventricle. An occurrence of premature ventricular contractions originating from the right ventricular outflow tract may be a sign of a lead prolapsing up to the right ventricular outflow tract.

4. CONCLUSION

This case illustrated a progressive prolapse of an LV lead into the right ventricle for more than 2 years. The mechanism of this phenomenon might have been reverse reel or ratchet syndrome. This phenomenon could have been missed because the tip of the LV lead was fixed with unchanged pacing measurements and the run of the thin LV lead could not be easily identified on the chest radiographs.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author.

CONFLICT OF INTERESTS

The author has received honoraria from St. Jude Medical.

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