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Case Report

Lead Macro Dislodgement: An Unusual Case of Late-Onset Reel Syndrome

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Lead macro dislodgement (LMD) is a known complication of cardiac implantable electronic device (CIED) implantation, with a range of presentation timelines, depending on the mechanism. Here, we report a case of an unusually late onset of Reel type LMD in an elderly woman.

Case Presentation

A 73-year-old Caucasian woman, with a past medical history significant for hypertension, chronic obstructive pulmonary disease, chronic renal disease, and nonischemic cardiomyopathy (New York Heart Association class II, American College of Cardiology/American Heart Association stage C), who underwent implantation of an atrio-biventricular cardiac defibrillator (Viva Quad, active fix leads, single coil, Medtronic, Minneapolis, MN) in December, 2015, presented to our office in March, 2021 for implantable cardioverter-defibrillator (ICD) management, as the recommended replacement time was approaching. At presentation, the patient denied syncope, chest pain, and inappropriate shocks. The patient was seen at an outside facility in January 2017, for syncope after standing up from a seated position, which was later attributed to orthostatic syncope. Device interrogation and chest radiograph at that time showed normal ICD parameters and position. The patient had another syncopal event while in the hospital, following a right shoulder arthroplasty in January 2018, but records from this visit were not available. The patient also underwent a left heart catheterization in July 2019.

During the office visit, the device implantation site (left pectoral area) showed no signs of local infection, dehiscence, or trauma. A 12-lead electrocardiogram in the office showed sinus rhythm with an idioventricular conduction delay, with QRS duration > 120 ms (Fig. 1A). Her most recent left ventricular ejection fraction was noted to be 35%-40%, an improvement from the 25% noted at the time of initial device implantation.

The device parameters at implantation were as follows: right atrium (RA) sensing 1.9 mV, impedance 684 Ohms, pacing threshold 1.75 V at 0.4 ms; right ventricle (RV) sensing 6.9 mV, impedance 551 Ohms, pacing threshold 0.75 V at 0.4 ms; and left ventricle (LV) sensing 10.8 mV, impedance 475 Ohms, pacing threshold 2.25 V at 0.4 ms. For ventricular pacing, activation was LV first (LV > RV) with a nominal V-V interval (time between pacing of the left and right ventrical) of 0 ms. However, in-office (March 2021) device interrogation showed a higher capture threshold in both the RA and LV leads (RA threshold 3.75 V at 1.5 ms; LV threshold 2.00 V at 1.5 ms). Diaphragmatic stimulation occurred with LV pacing at 4.5 V and 1.5 ms. The RV lead parameters were noted to be normal. She was scheduled for an outpatient generator change, but we received an elective replacement indicator alert 3 weeks after the office visit, so she then was scheduled promptly for a generator change.

The patient's previous and current chest radiographs are presented in Figure 2, arranged in the following temporal sequence: initial device implantation (December 2015); postsyncopal event (January 2017); pre-left heart catheterization (July 2019); and current office visit (March 2021). These radiographs show the migration of the RA and LV leads into the superior vena cava–RA junction (Fig. 2C) that occurred in the time between her syncopal event in January 2017 and the left heart catheterization in July 2019. The RA and LV leads were noted to be coiled around the generator, which was now displaced medial-caudally, compared to the original subclavicular location. However, the RV lead remained well positioned.

A 12-lead electrocardiogram performed prior to generator replacement showed sinus rhythm with an intraventricular conduction delay and a QRS duration > 120 ms (Fig. 1B). After the patient provided informed consent, a mutual decision was made to proceed with lead revision/extraction and reimplantation in the electrophysiology lab. We a used

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Novel Teaching Points

- Routine visits and device interrogations are paramount to maintain optimal CIED function.
- Imaging after surgery or physical impact near a device should be used to check lead position.

mechanical Evolution Shortie RL (Cook Medical LLC, Bloomington, IN), an EZ stylet (Philips, Andover, MA), and a Bulldo lead extender (Cook Medical LLC) to perform a complete transvenous extraction of dislodged RA and LV leads. On gross examination, the LV lead was normal, and the RA lead showed only mid-segment adhesions and distal calcifications. The original cardiac resynchronization therapy defibrillator (CRT-D) generator was replaced with a single-chamber ICD generator and was connected to the patient's original, normal functioning DF-4 RV lead.

Discussion

LMD is a postimplantation complication of CIED, with a reported incidence of about 1%-8%.[1-3] Reel syndrome is one type of LMD[4] (Twiddler and Rachet are the other commonly known syndromes).[5] Unlike in other varieties, the generator rotates on its transverse/Z-axis in Reel syndrome, resulting in the lead coiling around the device. Unlike in Twiddler syndrome, the leads usually are not damaged in Reel syndrome. Older age, female gender, large device pocket, compulsive generator manipulation, and underlying psychiatric history, obesity, and dementia[3,6] are established risk factors for LMD.

Compared to other varieties of LMD, Reel syndrome typically presents earlier after implantation, usually within 1

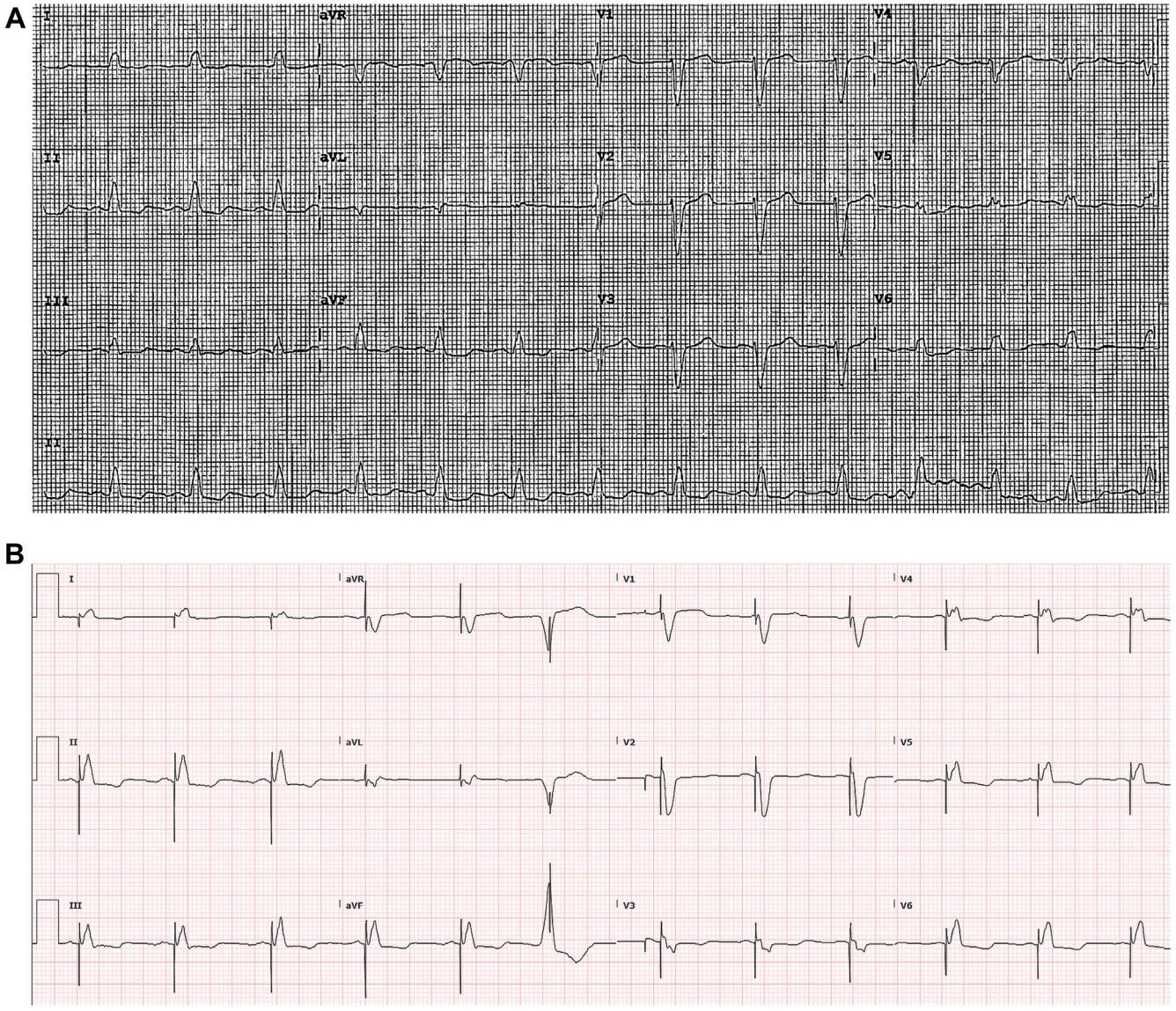

Figure 1. Electrocardiogram (**A**) at the current office visit with sinus rhythm and intraventricular conduction delay and (**B**) shortly before device replacement (25 mm/s, 10 mm/mV, 40.00-0 Hz).

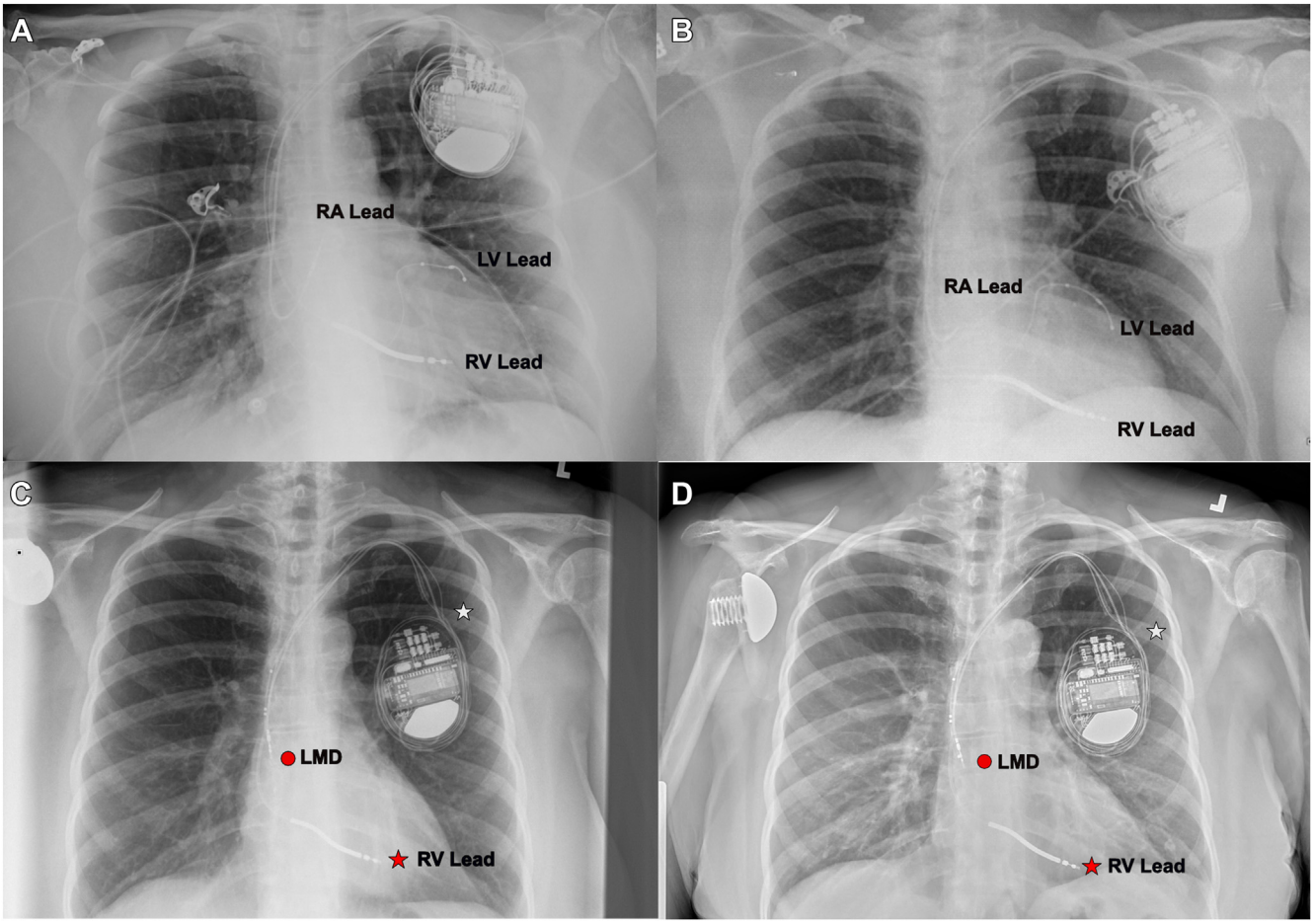

Figure 2. (**A**) Implantation chest radiograph with intact leads and well-positioned generator under the left clavicle in December 2015. (**B**) Post-syncope chest radiograph with intact leads and well-positioned generator under the left clavicle in January 2017. (**C**) Chest radiograph at 1.5 years postarthroplasty showing generator displacement medial-caudally (**white star**) with leads wrapped around it, as well as an untwisted proximal migration of leads (**red dot**) except for the right ventricular (RV) lead (**red star**) in July 2019. (**D**) Current office visit chest radiograph taken in March 2021 showing generator and lead positions similar to those in the July 2019 chest radiograph. LMD, lead macro dislodgement; LV, left ventricular; RA, right atrial.

month. Our patient exhibited features of Reel syndrome after an unusually long time; our patient's onset of Reel syndrome occurred between 18 and 43 months after device implantation (December 2015) based on chest radiographs taken on January 2017 and July 2019. As shown in Figure 2, a radiograph taken after a syncopal event a year before (January 2017) the arthroplasty demonstrated proper ICD and lead placement, but another radiograph taken about 1.5 years later (July 2019) showed evidence of Reel syndrome. Unfortunately, no records include a chest radiograph from shortly before or after the shoulder arthroplasty. One potential explanation for this abnormality is that the patient underwent a right shoulder arthroplasty 1.5 years prior (January 2018), which could have caused the device to shift, either from the physical trauma associated with the surgery or from the patient's compensatory use of their left arm following the surgery. The shift also could have occurred after the patient's fall while she was in the hospital following the right shoulder arthroplasty. Given the scarcity of imaging, pinpointing the cause for this late presentation of Reel syndrome is difficult.

Focusing on a few key technical aspects during implantation can decrease the risk of LMD, such as adequate lead slack, careful suture sleeve fixation using nonabsorbable sutures, and an appropriately sized pocket. In addition, routine follow-up visits and device interrogation are vital in the early diagnosis of LMD. Unfortunately, in this case, the patient did not follow-up routinely for ICD care, which resulted in a failure to promptly recognize that her RA and LV leads were dislodged.

Conclusion

Reel syndrome is a relatively uncommon variety of LMD. Longitudinal, periodic device monitoring, as well as imaging after incidents with a high likelihood of device manipulation, is imperative for timely diagnosis and management.

Ethics Statement

The research reported in this paper adhered to CARE guidelines.

Patient Consent

The authors confirm that a patient consent form(s) has been obtained for this article.

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Disclosures

The authors have no conflicts of interest to disclose.

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