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CASE REPORT

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# Late Ratchet syndrome involving isolated left ventricular lead dislodgement post-cardiac resynchronization therapy defibrillator generator change

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## Abstract

Lead dislodgement following cardiac implantable electronic device (CIED) generator change is rare. We report a case including the postulate mechanism of an isolated left ventricular lead dislodgement 3 months after cardiac resynchronization therapy defibrillator pulse generator change.

**KEYWORDS**

cardiac implantable electronic device, cardiac resynchronization therapy defibrillator, late Ratchet syndrome, left ventricular lead dislodgement, pulse generator change

## 1 | INTRODUCTION

Studies have shown that cardiac resynchronization therapy defibrillator (CRTD) reduced recurrent hospitalization rate as well as improved survival in selected symptomatic patients with systolic heart failure. However, lead dislodgement in particular left ventricular (LV) lead was disproportionally higher than non-LV leads (6.8% vs 0.6%).[1] We report a case (including the postulate mechanism) of LV lead dislodgement 3 months after CRTD pulse generator (PG) change.

## 2 | CASE REPORT

Seventy-eight-year-old man with ischemic cardiomyopathy (left ventricular ejection fraction of 20%), left bundle branch block (QRS duration of 150 ms), New York Heart Association class 3 received a CRTD in 2012 (Device: St Jude Medical Epic II+HFV357; right atrial lead: St Jude Medical Tendrill ST 1888TC/52 cm; right ventricular lead: St Jude Medical Durata 7122/60 cm; and LV lead: St Jude Medical Quickflex 1158T/86 cm). He responded to CRTD clinically. His device reached electively replacement indicator in November 2015. Accordingly, he underwent PG change. During the procedure, minimal capsulectomy and adhesiolysis were performed. Postprocedure chest X-ray (CXR) showed unchanged leads position (Figure 1) as compared with previous CXR.

Three months post-PG change, he had exacerbation of heart failure as well as 4 episodes of appropriate antitachycardia pacing (ATP) therapy for ventricular tachycardia. Interrogation of the device showed loss of biventricular pacing as the LV lead was dislodged with the tip at right atrium. This was confirmed by CXR (Figure 2). Patient denied manipulating the device.

In view of patient responded to CRTD, he was consented and underwent removal of LV lead followed by the replacement of new LV lead (St Jude Medical Quartet 1458Q/86 cm) uneventfully. Intraoperatively, the existing LV lead could move freely along the suture sleeve by gentle pulling and pushing maneuver.

Follow-up to 1 year showed no further exacerbation of heart failure and no further device therapy (ATP or shock) as well as stable LV lead parameters.

## 3 | DISCUSSION

Lead macrodislodgement can be due to manipulation of generator and/or leads either consciously or subconsciously by patient. There are 2 distinct mechanisms in this situation, namely Twiddler's syndrome and Reel syndrome. Twiddler's syndrome was first described

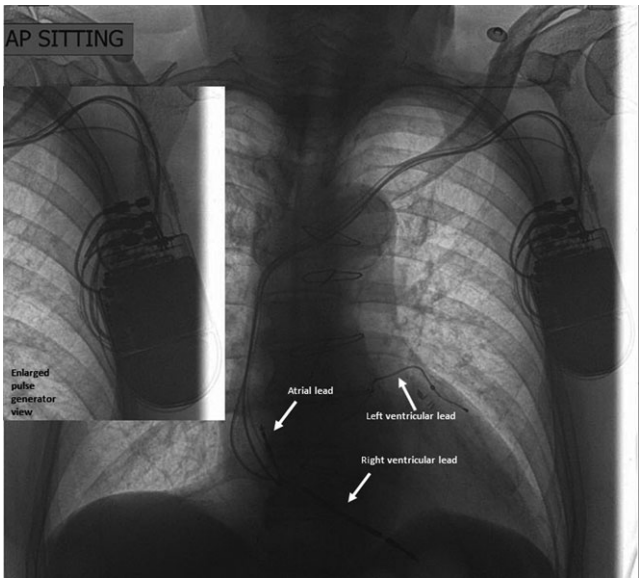


**FIGURE 1** Chest X-Ray (AP view) postpulse generator (with enlarged pulse generator view on left upper quadrant) change showing normal right atrial lead, right ventricular lead and left ventricular lead position

by Bayliss et al[2] in 1968. The mechanism involved rotation of PG on its long axis. Consequently, all the leads coiled around the PG in particular the header of PG. In Reel syndrome which was first described by Carnero et al[3] in 1999, the mechanism involved rotation of PG on its transverse axis. Consequently, all the leads rolled around behind the PG.

Another mechanism of lead macrodislodgement is Ratchet syndrome which was first described by Von Bergen et al[4] in 2007. In this situation, the Ratchet-like movement of lead in the suture sleeve due to loosening of the suture sleeve.

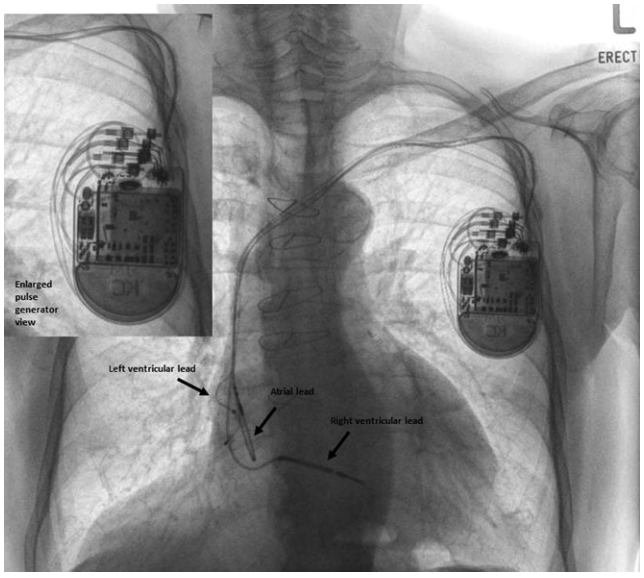


**FIGURE 2** Chest X-Ray (PA erect view with enlarged pulse generator view in left upper quadrant) showing left ventricular lead dislodged to right atrium

There was no published report on incidence of LV lead dislodgement in particular post-PG change. A single case report by Ejima et al[5] shows that there was a spontaneous LV lead retraction by Ratchet mechanism post-CRTD PG change following extensive and aggressive capsulectomy with adhesiolysis of the connective tissue around the lead and suture sleeve.

In our case, the most likely cause of lead macrodislodgement is Ratchet mechanism based on following reasons:

1. Patient denied manipulating the device. Furthermore, there was limited space available for the device to rotate either on its long axis or transverse axis even though partial capsulectomy was performed.
2. As only LV lead was dislodged while the right atrial and right ventricular lead remained intact, this could suggest that the mechanism is unlikely due to Twiddler's or Reel syndrome. Both Twiddler's and Reel syndrome would invariably result dislodgement of all leads.
3. There was evidence of loosening of suture sleeve following partial capsulectomy and adhesiolysis along the suture sleeve as the lead could easily move along it. Accordingly, care should be taken to avoid capsulectomy as well as adhesiolysis around the suture sleeve of LV lead. If capsulectomy and/or adhesiolysis was inevitable along the suture sleeve, additional sutures to fix the suture sleeve to underlying muscle should be performed.

On the contrary, as the CRTD system is 3 years old, the leads should adhered to the underlying tissue (due to fibrous tissue formation) and theoretically make it difficult to dislodge. In our case, apart from loosening of suture sleeve, we postulate that the LV lead (St Jude Medical Quickflex 1158T/86 cm) size (5.6 F proximal lead body, 5.0 F distal lead body, 4.0 F lead tip) as well as the passive LV lead tip being positioned in one of the branches of coronary sinus may contribute to minimal fibrous tissue formation and thus facilitate lead dislodgement.

## 4 | CONCLUSIONS

Our case highlighted that there is an LV lead macrodislodgement by Ratchet mechanism due to loosening of the suture sleeve. The loosening of the suture sleeve was due to capsulectomy as well as adhesiolysis being performed around it during PG change procedure. To prevent iatrogenic complication as in this case at the time of PG change, the tightening of the suture for the lead fixation sleeve should be reconfirmed.

### CONFLICT OF INTEREST

Authors declare no conflict of interests for this article.

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