Title: Pacemaker Lead Migration and Delayed Presentation of Right Ventricular Perforation

Authors: Austin Kluis MD, Lena Hasson MD, John J. Squiers MD, Ali Yousif MD, J. Michael DiMaio MD, Justin Schaffer MD.

Affiliations: Baylor Scott & White The Heart Hospital

Disclosure: None.

Funding Statement: Philanthropic Gift by Satish and Yasmin Gupta to Baylor Scott & White the Heart Hospital

Informed consent statement: IRB approval was not required given that this was a single patient case report. The patient provided informed written consent for publication of this report's data

Word Count:

Correspondence:

Austin Kluis
BSW The Heart Hospital
1100 Allied Drive
Plano, TX 75093
Austin.Kluis@bswhealth.org
Central Picture

CT Heart demonstrates right ventricular lead perforation through the right ventricle and into the chest wall.

Central Message:
Perforation of the right ventricular wall following lead placement can present in a delayed fashion. Patient symptoms, device interrogation and imaging are critical factors in evaluation and management.
Pacemaker Lead Migration and Delayed Presentation of Right Ventricular Perforation

A 70-year-old female with a history of non-ischemic cardiomyopathy (ejection fraction of 20-25%) underwent placement of a Cardiac Resynchronization Therapy with Defibrillator (CRT-D) device at outside hospital. Implantation was uneventful, and the patient was discharged home on post-op day 1 with normal electrical parameters (0.8-volt threshold, R-Wave 5.6 millivolts (mV), and Impedance 716 ohms) and chest x-ray (CXR) (Supplementary Figure 1).

That evening, the patient had an electrical sensation in her left chest and presented to outside emergency department where she was discharged home after a reassuring EKG and CXR. Her symptoms persisted and she presented to our center the next day where device interrogation demonstrated no right ventricular lead capturing. The CXR (Figure 1) and transthoracic echocardiogram (Supplementary Figure 2) demonstrated RV lead migration with perforation of the right ventricle (RV). This was confirmed on CT heart (Figure 2A-F).

It was determined at our interdisciplinary high risk heart conference that the patient have open, off-pump, lead exchange. Intraoperatively, the RV lead extended through the RV and into intercostal muscle requiring blunt reduction (Video 1 & Figure 3). The RV lead was exchanged, perforation oversewn (Figure 4), and the patient was discharged home on hospital day 4 (Supplementary Figure 3). IRB approval was not required given that this was a single patient case report. The patient provided informed written consent for publication of this reports data.
Figure 1. CXR two days after CRT-D placement

Apical migration of the RV lead is seen compared to the postoperative film and in reference to the coronary sinus lead. Of note, there is no pleural effusion.
Figure 2A-F. CT Heart protocol with 4D reconstruction

(A&B) Scout films showing RV lead mispositioning. (C) Axial view of initial CT demonstrating lead penetration through the RV into chest wall. This is more clearly depicted on the reconstructed (D) sagittal and (E) axial images. (F) The RV lead can be seen penetrating the right ventricle near the left anterior descending artery.
Video 1. Intraoperative video of RV perforation

The lead perforated the RV at the apex near the left anterior descending artery. There was scant serosanguinous fluid in the pericardium and the puncture site prior to lead removal was hemostatic.
Figure 3. Still image from Video
The lead perforated the right ventricle at the apex near the left anterior descending artery
Figure 4. Right ventricular repair after lead removal
The perforation was oversewn with prolene sutures following lead removal
Supplementary Figure 1. Initial CXR after CRT-D placement

Placement of Gallant HF generator with leads in the right atrium (46cm Lead Tendril STS), coronary sinus (86cm 1458q Quartet lead), and right ventricle (RV) (65cm 8 French lead defibrillator permanent bipolar retractable helix fixation Novus). (St. Jude Medical, Sylmar, CA; Model numbers CDHFA500Q, 2088TC46, 1458Q86NC, LDA210Q65).
Supplementary Figure 2. Transthoracic Echocardiogram apical four chamber view

As indicated by the white arrow, the right ventricular lead can be seen perforating the right ventricle and into the chest wall. Of note, there is no pericardial effusion.
Supplementary Figure 3. Postoperative CXR

Postoperative CXR demonstrates normal lead positioning