#### **Case Report**

# Usage of Point-of-care Ultrasonography for Rapid Diagnosis of Cardiac Perforation by Pacemaker Lead



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### Abstract

Cardiac perforation after pacemaker placement is a rare form of cardiovascular emergency. A case of an elderly adult undergoing hemodialysis that contributed to this emergency is presented. The history, clinical imaging findings, and surgical procedures for clinical assessment are briefly described. Point-of-care ultrasonography (POCUS) was used to identify, locate, and perform ultrasonography-guided pericardiocentesis. The role of POCUS in cases of tamponade has been emphasized in clinical settings.

Keywords: Cardiac perforation, pacemaker lead, point-of-care ultrasonography

## INTRODUCTION

Cardiac perforation due to pacing lead displacement is an uncommon condition with published rates of 0.1%–0.8% for pacemakers and 0.6%–5.2% for implantable cardioverter defibrillators.<sup>[1]</sup> Perforation usually develops within 1 month of implantation. According to the onset time, perforation can be classified into three categories: acute (developed within 24 h of implantation,), subacute (onset within 1 month), and delayed.<sup>[2]</sup> Computed tomography (CT) is the gold standard diagnostic tool. However, point-of-care ultrasonography (POCUS) imaging is useful in rapid detection of pericardial effusion, ascertaining sonographic evidence of tamponade sign, and searching for displaced pacing lead for rapid diagnosis.

## **CASE REPORT**

A 73-year-old male with end-stage renal disease undergoing regular hemodialysis for decades and sick sinus syndrome after pacemaker implantation 1 week ago presented to the emergency department (ED) with acute onset of dyspnea while undergoing hemodialysis. A low systolic blood pressure of 90 mmHg with confusion status was also noted. Neither iatrogenic blood loss nor recent signs of

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gastrointestinal bleeding episodes have been found. Physical examination revealed an engorged jugular vein with a distant heart sound. The nature of the shock was further studied using POCUS (GE LOGIQ-e, GE Healthcare, Milwaukee, WI). Huge heterogeneous pericardial effusion with early diastolic right ventricle (RV) collapse and free pacemaker lead protruding outside the RV free wall [Figure 1a] were present in the subxiphoid view. Apical four-chamber view also revealed discontinuation of the RV free wall [Figure 1b], suggested RV free wall rupture. Emergent pericardiocentesis was performed by draining over 200 ml of bloody fluid. Contrast-enhanced CT confirmed a pacemaker lead protruding outside the right ventricular wall with pericardial effusion [Figure 2]. The patient was shifted to the operating room, where he underwent cardiac repair. The pacemaker lead was found to be penetrating out of the RV free wall with a 1 cm lacerated, slowly bleeding wound. He had a smooth postoperative course with resolution of his symptoms, was discharged home in a stable condition, and was doing well on follow-up 1 month later.

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Chen and Ho: Cardiac perforation by pacemaker lead



**Figure 1:** (a) Pericardial effusion and pacemaker lead (yellow arrow) protruding outside right ventricle free wall. (b) Pericardial effusion and discontinuation of right ventricle free wall (red arrow)

## DISCUSSION

The reported incidence of all types of lead perforation is approximately 0.1%-0.8%.[3] Symptoms of lead perforation include chest pain, dyspnea, syncope, inadequate implantable cardioverter-defibrillator (ICD) shocks, muscle or diaphragm stimulation, abdominal pain, hiccups, and pleural or pericardial effusions.<sup>[4-7]</sup> This indicates that there are no specific symptoms of this rare clinical condition. The risk factors of lead perforation have not been well studied. A higher perforation rate might be related to the physician's experience, female sex, old age, body mass index < under 20 kg/m<sup>2</sup>, corticosteroid therapy, anticoagulation, some type of lead including temporary stimulation, atrial lead, lead with active fixation system, defibrillator leads, lead with double spirals (more wires, stiffer), excessive length during implantation, lead with small diameter (increased force per unit area), and high resistance (small tip surface) lead.<sup>[3,6-9]</sup>

Lead perforation is suspected when <3 mm separates the tip of the lead from the epicardial fat detected on chest X-ray (epicardial fat-pad sign).<sup>[10]</sup> Although chest radiography is the initial choice of diagnostic tool, it may not be able to detect minimal lead migration. In this case, perforation was difficult to diagnose on chest radiography as the tip of the lead was outside the RV free wall and lying just above the diaphragm. While CT remains the gold diagnostic tool for precisely demonstrating the pacemaker lead position<sup>[10]</sup>, POCUS is a timely, efficient, effective, and patient-centered alternative in the ED setting. By recognition of new-onset pericardial effusion in patients with pacemaker or ICD implantation by POCUS, emergency physicians should search evidence of displaced lead along the free wall of RV and apex because lead perforation is one of the uncommon causes of pericardial effusion that needs surgical intervention.

## **Declaration of patient consent**

The authors certify that they have obtained appropriate patient consent form. In the form, the patient has given his consent for the images and other clinical information to be reported in the



Figure 2: Computed tomography of chest confirmed free pacemaker lead protruding to right ventricle wall with pericardial effusion

journal. The patient understands that his name and initial will not be published and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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## **Conflicts of interest**

There are no conflicts of interest.

#### REFERENCES

- Carlson MD, Freedman RA, Levine PA. Lead perforation: Incidence in registries. Pacing Clin Electrophysiol 2008;31:13-5.
- Khan MN, Joseph G, Khaykin Y, Ziada KM, Wilkoff BL. Delayed lead perforation: A disturbing trend. Pacing Clin Electrophysiol 2005;28:251-3.
- Haque MA, Roy S, Biswas B. Perforation by permanent pacemaker lead: How late can they occur? Cardiol J 2012;19:326-7.
- Celik T, Kose S, Bugan B, Iyisoy A, Akgun V, Cingoz F. Hiccup as a result of late lead perforation: Report of two cases and review of the literature. Europace 2009;11:963-5.
- Nichols J, Berger N, Joseph P, Datta D. Subacute right ventricle perforation by pacemaker lead presenting with left hemothorax and shock. Case Rep Cardiol 2015;2015:983930.
- Rydlewska A, Małecka B, Zabek A, Klimeczek P, Lelakowski J, Pasowicz M, *et al.* Delayed perforation of the right ventricle as a complication of permanent cardiac pacing-is following the guidelines always the right choice? Non-standard treatment - A case report and literature review. Kardiol Pol 2010;68:357-61.
- Sterliński M, Przybylski A, Maciag A, Syska P, Pytkowski M, Lewandowski M, *et al.* Subacute cardiac perforations associated with active fixation leads. Europace 2009;11:206-12.
- Hirschl DA, Jain VR, Spindola-Franco H, Gross JN, Haramati LB. Prevalence and characterization of asymptomatic pacemaker and ICD lead perforation on CT. Pacing Clin Electrophysiol 2007;30:28-32.
- Ahmed A, Shokr M, Lieberman R. Subacute right ventricular perforation by pacemaker lead causing left-sided hemothorax and epicardial hematoma. Case Rep Cardiol 2017;2017:1264734.
- Kautzner J, Bytesník J. Recurrent pericardial chest pain: A case of late right ventricular perforation after implantation of a transvenous active-fixation ICD lead. Pacing Clin Electrophysiol 2001;24:116-8.