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Kasuistika | Case report

An unusual case of a subacute right ventricular perforation from a pacemaker lead with subsequent left hemothorax

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Cardiac pacing is a common and proven therapy in the treatment of many cardiac conduction abnormalities and arrhythmias. Despite their lifesaving potential, they are limited by device related complications, notably infection and mechanical complications, which includes myocardial perforation. Though rare, perforation may potentially be fatal. Many times, these perforations are acute, occurring within the first twenty-four hours and common sequelae include pneumothorax, hemopericardium, cardiac tamponade and death. While hemothorax has been reported, it is extremely rare. As time progresses, subacute and delayed perforations become even more uncommon and a hemothorax as a complication to a subacute perforation is exceedingly rare [1]. Here, we present a case of a 90-year-old female with a right ventricular perforation and subsequent development of a left hemothorax twenty-nine days after pacemaker insertion.

A 90-year-old female with a history significant for coronary artery disease and sick sinus syndrome with a Medtronic pacemaker placed twenty-nine days prior presented to the emergency department with overall lethargy and feeling "unwell". She complained of shortness of breath, bloating and pleuritic chest pain. A chest x-ray showed a retrocardiac opacity that was initially believed to be pneumonia. However, her heart rate was noted to have several transient episodes of rates into 30s with pauses. Additionally, her hemoglobin and hematocrit were noted to have decreased from a baseline of 9.5 g/dL and 29.3% to 7.1 g/dL and 21.5% respectively. There was no overt evidence of bleeding. An interrogation of her pacemaker showed a malfunctioning right ventricular lead that was unable to capture at 8.0 V in unipolar and bipolar pacing modes. A computed tomography (CT) of the thorax without contrast was obtained and it showed the right ventricular (epicardial) pacemaker lead perforating the apical right ventricular wall and into the lingua along with

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large left pleural effusion with a density consistent with hemorrhage (Fig. 1). A bedside echocardiogram (ECHO) showed the lead coursing to the apex and through the right ventricle and cardiothoracic surgery was consulted. The patient was emergently taken to surgery for a sternotomy with repair of the right ventricle with sutures while the ventricular pacer lead was not removed, rather, it was secured to the epicardium. In addition, a chest tube was placed, with 700 cc of blood drained from the left pleural cavity. In the epicardial position, the lead showed appropriate function, and bedside monitor showed the patient was completely atrial paced that was capturing and sensing. There was concern that her right ventricular lead would not be able to function in the epicardial lead position, however the impedance and threshold surpassed expectations and her pacer was programmed back to her permanent settings.

The first lead perforation was first described in 1969 by Barold and Center [2]. Since that time, the incidence has decreased due to more flexible and thinner leads. The reported rate of pacemaker lead perforation is 0.1–3% [1]. Perforations are termed based on the time period in which they occur after implantation, therefore 24 hours after implantation is termed acute, up to 30 days after is termed subacute, and greater than 30 days is delayed. Subacute and delayed perforations are more uncommon and often go unrecognized [1–3]. The thinner right atrial or ventricular wall is predisposed to perforation most commonly [3]. Several studies have looked at predisposing factors in lead perforation, including temporary leads, steroid use, active fixation leads, a body mass index less than 20 kg/m, old age, and female gender.[2] Our patient had several risk factors for perforation including age, gender and active fixation of pacer leads.

The exact pathophysiology is believed to be multifactorial. One belief is that smaller and thinner leads exert an increased for per unit area on the ventricular wall. In addition, increased lead slack may lead to increased tension on the free wall and cause late perforations [2]. Active lead fixation has been shown to have a higher perforation rate to due over-torquing (which may also be related to operator technique) and lead thickness [3,4].

Signs and symptoms of pacemaker perforation are dependent on the location of the displaced lead and timing of the perforation. The most common presenting symptoms are chest pain, dyspnea, diaphragmatic contraction, abdominal pain and dizziness [1,2]. An important sign can be the changing in pacing parameters such as capture threshold and sensing threshold as perforation may lead to pacing and sensing failures, depending on the location of the displaced lead and may lead to hemodynamic instability due to arrhythmia [1–3]. Hemopericardium leading to cardiac tamponade with resultant hemodynamic instability, shock, heart failure and cardiac arrest is a feared complication [1]. A distinguishing feature of subacute and delayed perforations is the low risk of cardiac tamponade and many times present asymptomatically or with vague symptoms [5]. Lead migration into the left pleural cavity and lung, though has been described is believed to be rare [5,6]. To this end, left hemothorax, as seen in this patient, is a rare complication, and has only been described in four other instances [1,5–7]. The most common presenting symptom in these instances is pleuritic chest pain [6,7].

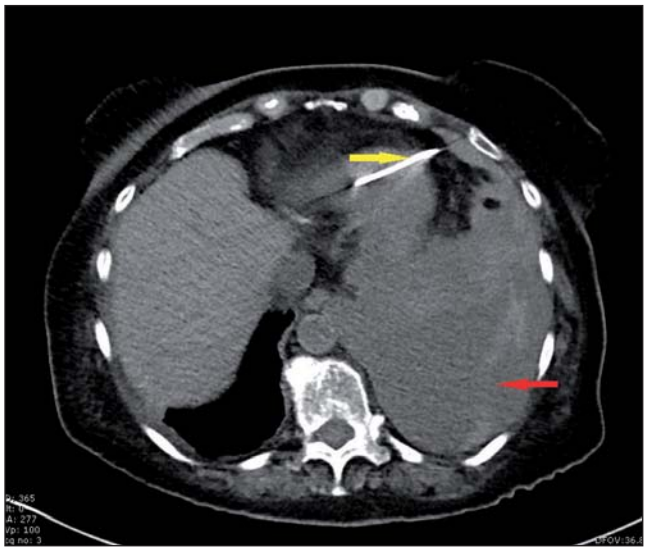

Fig. 1 – The yellow arrow shows the pacer lead extending through the right ventricle. The red arrow shows the left pleural effusion/ hemothorax.

Initial diagnostic workup should include chest x-ray and echocardiogram (ECHO). A chest x-ray may show if a lead extends beyond the cardiac silhouette as well as associated extracardiac manifestations including pleural or pericardial effusion and pneumothorax. A bedside ECHO may help assess electrode location, presence of the pacemaker lead tip in the pericardium as well as presence of a pericardial effusion. Initial workup should also include pacemaker interrogation, however, normal function and absence of sensing and pacing failure do not rule out pacemaker perforation [1,2]. However, a computed tomography (CT) of the chest is currently the gold standard in the diagnosis of pacemaker lead perforations. A CT chest can detect pacemaker lead displacement that is missed on chest x-ray or ECHO as well as detect pericardial effusions/ hemopericardium or pleural effusion/hemothorax [1,2].

Management is dependent on hemodynamic status, symptoms, and presence of pericardial or pleural effusion. Emergent surgery is required in cases of hemodynamic instability, if cardiac tamponade is imminent or if respiratory failure from effusion/hemothorax is present or imminent [1,2]. In hemodynamically stable patient, the lead may be extracted with direct traction or via percutaneous lead extraction in the operating room under close monitoring [1,2,5]. Once extracted, a new lead should be placed in a new location, ideally in the right ventricular outflow tract or at the intraventricular septum. There are no definitive guidelines dictating management in those stable patients with asymptomatic perforations or those with chronic perforations without lead malfunction [1,2,5]. A retrosepective series of patients who underwent a CT chest that showed asymptomatic perforation is a relatively common phenomenon and in most cases do not result in any electrical conduction disturbances [6]. Some experts recommend lead removal and replacement in all cases given the implications of retaining a non-functional lead and the potential for further migration while others

recommend against removal of a chronically perforated lead without pacemaker malfunction [1,2,5–7].

Pacemaker insertion is a relatively common intervention in the management of cardiac arrhythmias. Though complications from pacemaker insertion are relatively uncommon, they can be life-threatening, especially if not recognized promptly. Thus, these complications, including cardiac perforation with its associated sequelae, which may include should be considered in all patients in the appropriate clinical setting.

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Ethical statement
Authors state that the research was conducted according to ethical standards.

Informed consent
I declare, that informed consent requirements do not apply to this manuscript as there are no patient identifying factors present.

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