

## Accidentally Discovered Late Perforation of Pacemaker Lead to Right Ventricle, Pericardium and Diaphragm: Case Report

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### Abstract

**Introduction:** Placements of pacemakers have become a routine procedures and are generally associated with low complication rates. Late permanent pacemaker PPM lead perforation is an uncommon but clinically significant complication. Chest radiograph is most commonly used imaging modality to diagnose the lead perforation by following the lead tip position. Usually it is easier to diagnose if the lead tip is outside the cardiac shadow.

We, describe an accidentally discovered cardiac and diaphragmatic perforation with the PPM lead in one of our patients.

**Case Description:** A 70-year-old gentleman from a rural area underwent single chamber PPM implantation through left subclavian vein approach for treatment of sinus node dysfunction. He was discharged in good condition and pre-discharge PPM interrogation found loss of capture and intermittent sensing failure. Pre-discharge echocardiogram showed endocardial lead in situ.

After 6 months he came to the outpatient clinic for follow up, chest-X ray showed that the pacemaker lead is outside the cardiac shadow perforating the right ventricle, pericardium and left diaphragmatic copula. CT scan with contrast of the chest confirmed the diagnosis. As the patient was asymptomatic and his ECG showed normal sinus rhythm, so after discussing the case the consensus was to take out surgically the whole PPM lead and the pulse generator as well.

In the operating room after left sub-mammary incision we saw the lead outside the heart so it was cut and the remaining proximal part with the pulse generator was pulled out via the left subclavian incision. The right ventricle and the diaphragm were repaired and the patient tolerated the procedure well and discharged home after few days in a good condition.

**Conclusion:** After PPM implantation, one should be aware of lead perforation. Interventricular septal fixation of the lead may decrease the incidence of perforations.

The CT scan of chest should be done earlier to confirm the diagnosis in situations with high possibilities of lead displacement along with close observation.

**Keywords:** Pacemaker; ICD; Lead Perforation; Chest-X Ray; CT Chest

### Introduction

Placements of pacemakers or implantable cardioverter defibrillators (ICDs) have become a routine procedures and are generally associated with low complication rates [1]. Usually the perforation of leads occurs shortly after implantation and it is an acute and potentially life-threatening event [2]. Late ICD or PPM lead perforation is an uncommon but clinically significant complication [3]. Chest radiograph

is most commonly used imaging modality to diagnose the lead perforation by following the lead tip position [4]. Usually it is easier to diagnose if the lead tip is outside the cardiac shadow [5,6].

We, describe an accidentally discovered cardiac and diaphragmatic perforation with the pacemaker lead in one of our patients.

### Case Description

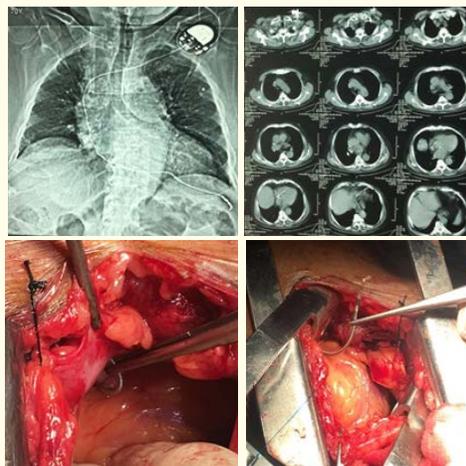
A 70-year-old gentleman from a rural area underwent single chamber permanent pacemaker (PPM) implantation through left subclavian vein approach (Medtronic single chamber, 58 cm, 5 FG sheath) for treatment of sinus node dysfunction. He was discharged in good condition and pre-discharge PPM interrogation found loss of capture and intermittent sensing failure. Pre-discharge echocardiogram showed endocardial lead in situ.

Then he missed the follow up appointments and he did not show up for about 6 months when he came back to the outpatient clinic for follow up, chest-X ray showed PPM lead outside the cardiac shadow and perforating the pericardium and left diaphragmatic copula (Figure 1a).

Also, Fluoroscopy image of the PPM, when compared with implantation time showed displacement of the lead tip to a level just below the left diaphragmatic copula. CT scan of the thorax confirmed the diagnosis and showed perforation of the PPM lead to the right ventricle, pericardial sac and the left diaphragmatic copula (Figure 1b).

As the patient was asymptomatic apart from chronic hiccup and his ECG showed normal sinus rhythm, so after discussing the case between cardiologist, EP consultant and cardiac surgeons the consensus was to take out surgically the whole PPM lead and the pulse generator as well.

In the hybrid operating room with help of fluoroscopy after small left sub-mammary incision the lead outside the heart was cut with a heavy scissor and the remaining part with the pulse generator was pulled out via the left subclavian incision. The whole in the right ventricle was surrounded by a heavy fibrosis and closed with 2 Teflon pledget\prolen 4\0 stiches. The diaphragmatic area was repaired with the same technique as well (Figure 1c, 1d). The chest wall was closed after putting a chest tube size 28F and the post-operative chest-X ray and Echocardiography were satisfactory.



**Figure 1:** Images of the perforating lead: (a) CX-ray showing perforating pacing lead extending outside the pericardium reaching down to under the diaphragm. (b) CT chest showing the same result. (c) Left thoracotomy sub-mammary incision showing the pacemaker lead perforating the right ventricular wall. (d) The lead and its tip before we cut out.

### Discussion

Cardiac perforation after pacemaker or ICD implantation is an infrequent complication. The rate of lead perforation are 0.1 - 0.8% after pacemaker implantation and 0.6–5.2% after ICD implantation [7]. But there is a large group of clinically silent perforations 15%, which was diagnosed accidentally during CT scan performed for other indications [8].

Chest radiograph is the most commonly used imaging modality to diagnose the lead perforation by analysing lead tip position and lead curvature. It is easier to diagnose when the lead tip is outside the cardiac shadow and difficult when the signs are subtle. Lead evaluation becomes complex in the presence of pleural effusion, pericardial effusion and/or pneumothorax. Transthoracic echo is very simple bedside tool which helps for the diagnosis and monitoring the cardiac dynamics. Depending on the site of perforation there may be abnormalities in sensing or capturing on ICD or PPM interrogation but normal function cannot exclude cardiac perforation [1,7,8].

Various reports showed that most of the migrated leads could be removed safely by simple traction under fluoroscopy and or by transesophageal echo monitoring [9]. But in our case the treatment was different and after discussing the case between the cardiologists, electrophysiologists and cardiac surgeons the consensus was that it safer to remove it surgically due to the long migration course of the perforating lead.

### The take home messages from our case are:

After PPM implantation, one should be aware of lead perforation. Post-operative repeated follow up with x-ray and ECG would help detection of early problems.

Patient and patient's family education and frequent regular routine follow up is mandatory after PPM implantation.

Whenever there is a suspicion of perforation The CT scan of chest should be done earlier to confirm the diagnosis in situations with high possibilities of lead displacement along with close observation.

Improving the technique for pacemaker insertion as Interventricular septal fixation of the lead may decrease the incidence of perforations.

### Conclusion

After PPM implantation, one should be aware of lead perforation. Interventricular septal fixation of the lead may decrease the incidence of perforations.

PPM lead perforation may present with various symptoms but the associated clinical condition can mask it or make it more difficult to diagnose and one needs to have high degree of clinical suspicion. Chest radiograph may be inconclusive for PPM lead perforation. The CT scan of chest should be done earlier to confirm the diagnosis in situations with high possibilities of lead displacement along with close observation.

To our knowledge it is the first report on PPM lead perforation to the myocardium, pericardium and diaphragm.

### Disclosure

All authors have none to declare.

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