

Traumatic Right Atrium Perforation Causing a Pneumothorax and Pneumopericardium, Treated Conservatively

Review began 02/02/2024
Review ended 02/15/2024
Published 02/20/2024

© Copyright 2024

Maraj et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Diva Maraj¹, Omair Ahmed¹, Muhammad Qureshi¹, Hussein Othman²

1. Internal Medicine, Henry Ford Jackson Hospital, Jackson, USA 2. Cardiology, Henry Ford Jackson Hospital, Jackson, USA

Corresponding author: Diva Maraj, divamaraj@mail.rossmed.edu

Abstract

Pacemaker insertion is a daily occurrence in the United States of America, and it is a relatively common procedure; however, complications can occur. One common complication includes the development of a pneumothorax; however, there are rare instances where patients can develop a pneumopericardium as well. We present a case of a patient who underwent dual chamber pacemaker implantation complicated by a pneumothorax and left-sided pneumopericardium, which is a rare finding. This patient initially presented with syncopal episodes and a dual chamber pacemaker was inserted; however, not long after, the patient developed pericarditis and was found to have a pneumothorax and a pneumopericardium. In these cases, patients can be treated with chest tube insertion, lead extraction, or even conservatively, depending on the patient's clinical status. Various reasons exist for the development of a pneumothorax and pneumopericardium; however, the guidelines on management are still unclear and require further study. In our patient, his pneumothorax and contralateral pneumopericardium were treated conservatively with stable follow-up post-hospitalization.

Categories: Cardiology

Keywords: conservative, pacemaker lead perforation, pacemaker, pneumopericardium, pneumothorax (ptx)

Introduction

Around 190,000 patients undergo pacemaker implantation yearly in the United States and although it's a relatively safe procedure, there can be complications, such as pneumothorax, cardiac tamponade, and infection [1]. Pneumopericardium after pacemaker implantation is an extremely rare complication, as the most common complication after pacemaker implantation is usually a unilateral pneumothorax, with a frequency of 1-2% [1]. A pneumothorax can present with symptoms such as pleuritic chest pain, shortness of breath, or be completely asymptomatic [1,2]. Interestingly, pneumothoraces are usually always ipsilateral to the pacemaker and contralateral events are rare [1-3]. An even rarer complication includes the development of a pneumopericardium, in which patients may require a chest tube, or even lead extraction [4]. There are currently three other known case reports in the current literature, in which a patient presented with a contralateral pneumopericardium and pneumothorax after pacemaker insertion, which requires the need for further management and research into this condition. We present a case of a 68-year-old male who underwent dual chamber pacemaker implantation complicated by a contralateral pneumopericardium and pneumothorax. This article was previously presented as a meeting abstract at the 2023 American Heart Association Annual Scientific Meeting on November 11th, 2023.

Case Presentation

A 68-year-old male presented to the hospital with two syncopal events while driving, which was a new occurrence for the patient. The patient noted that during intermittent times of the day, he would experience dizziness, lightheadedness, and palpitations, resulting in a syncopal episode. The patient had normal heart sounds on examination, bradycardic, with no gallops or rubs, and his lungs were clear to auscultation. The patient also had negative orthostatic vital signs. The patient had a past medical history of coronary artery disease status post percutaneous coronary intervention to the obtuse marginal artery and left circumflex, hypertension, and benign prostatic hyperplasia. The patient's coronary artery disease was managed with Aspirin, Plavix, and statin therapy. The patient had a completed 12-lead electrocardiogram (EKG) while admitted, which showed sinus bradycardia with long pauses of up to 6.2 seconds. Thus, the patient further underwent a dual chamber pacemaker implantation through the left subclavian vein approach, and using the modified Seldinger technique, a 27 F introducer was placed into the left subclavian vein. Through this introducer, the atrial and ventricular lead was advanced to the high right atrium and right ventricular apex where excellent pacing and sensing threshold was observed. It was noted that there were multiple attempts made to place the right atrium lead. After the procedure, the patient developed severe right-sided chest pain, and a repeat 12-lead EKG showed diffuse ST segment elevations, consistent with pericarditis. An immediate chest X-ray was obtained which showed a right-sided pneumothorax (Figure 1), and a chest CT showed a large right-sided pneumothorax and a contralateral pneumopericardium (Figures 2, 3). The patient

How to cite this article

Maraj D, Ahmed O, Qureshi M, et al. (February 20, 2024) Traumatic Right Atrium Perforation Causing a Pneumothorax and Pneumopericardium, Treated Conservatively. Cureus 16(2): e54566. DOI 10.7759/cureus.54566

had a chest tube placed and his pacemaker was interrogated and showed stable function. The patient also had a repeat CT chest which showed significant improvement in the pneumopericardium, and pneumothorax and he was treated conservatively.

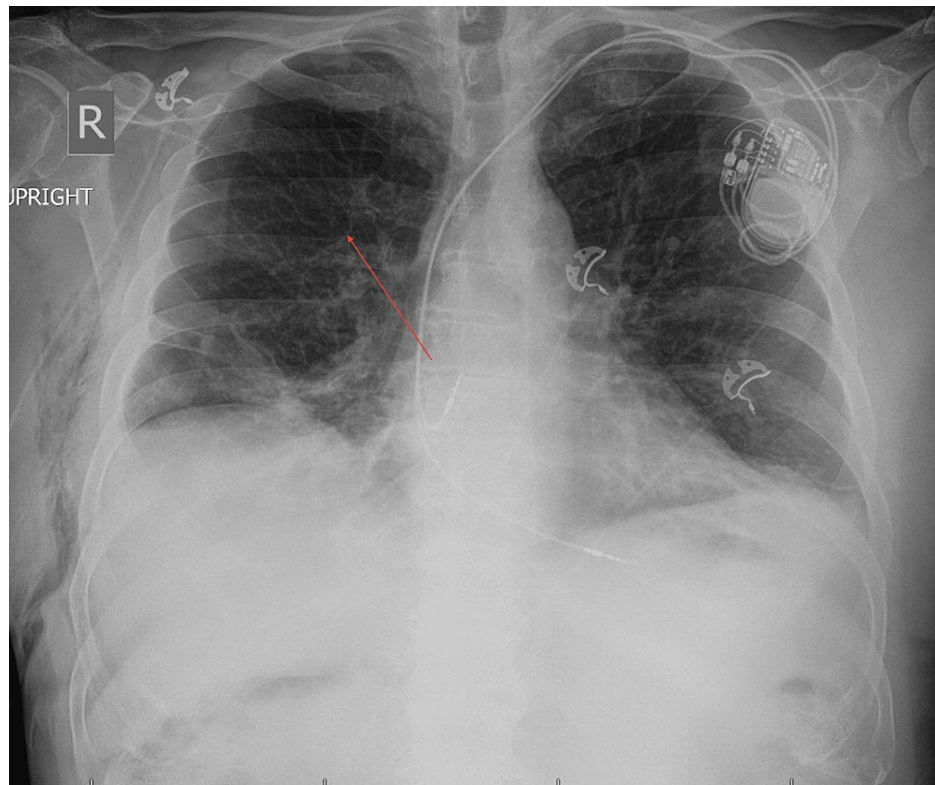


FIGURE 1: Chest X-ray demonstrating contralateral pneumothorax to the pacemaker, as indicated by the arrow

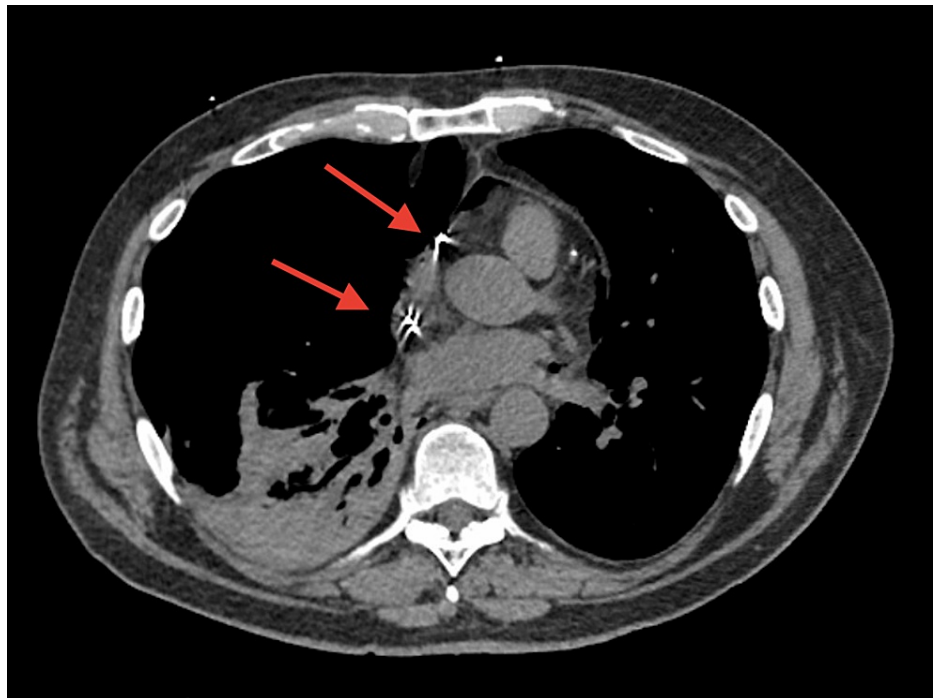


FIGURE 2: CT of the chest demonstrating tip of wires (red arrows) appears to be in the region of the right atrium, right ventricle region though the right ventricular lead appears to extend beyond the wall of the right ventricle area and it is hard to determine if it is within the wall or within pericardium. Similarly, right atrial lead also appears intended right atrium and perforation is also a possibility.

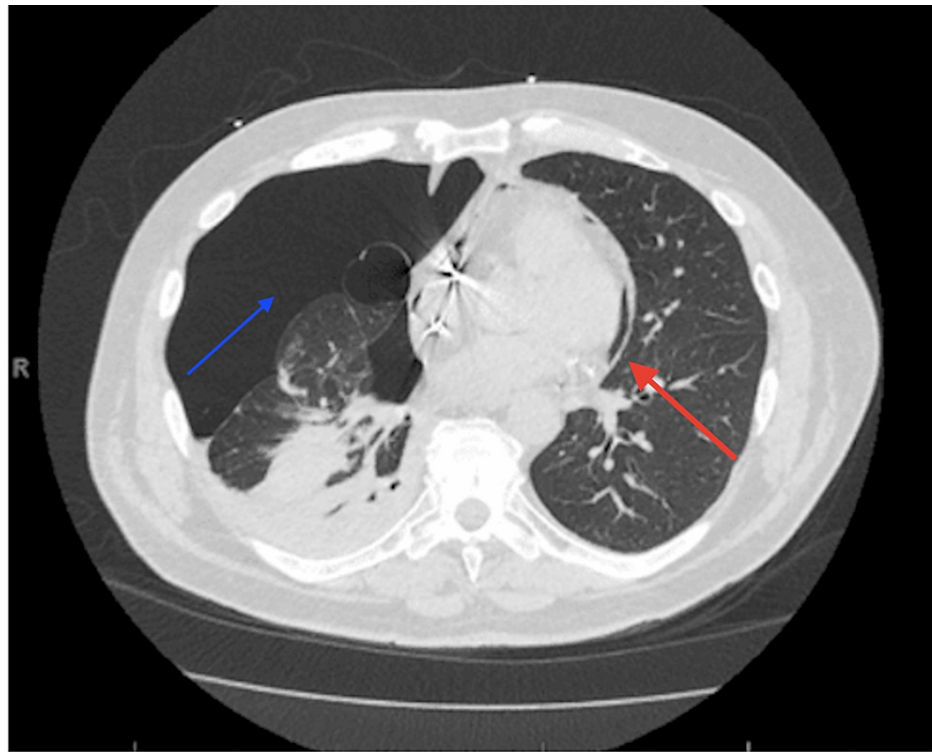


FIGURE 3: CT of the chest showing both a right-sided pneumothorax (blue arrow) and a contralateral pneumopericardium indicated by the red arrow.

After the patient's hospitalization, he continued to improve after his chest tube was removed and he followed up with cardiology outpatient and remained stable. The patient also completed repeat chest imaging, which showed resolution of the patient's pneumothorax and pneumopericardium. He denied any further episodes of chest pain, shortness of breath or syncopal episodes and his pacemaker continued to remain stable and functional on subsequent interrogation.

Discussion

Ipsilateral pneumothorax and cardiac perforation are not uncommon following pacemaker implantation; however, contralateral pneumothorax and pneumopericardium are extremely rare, with currently only three previous case reports documented [1,2]. In our patient, it appears that the right atrium lead perforated through the right atrium into the right pleural space creating a fistula between the pericardial and pleural spaces, seen in Figure 2 above. This resulted in pneumothorax and a contralateral pneumopericardium. Interestingly, previous case reports, such as Nantsupawat et al. [4], had demonstrated a very large P-wave on one of the perforations with symptoms developing one day after the procedure and all perforations had occurred with active fixation leads from three separate manufacturers [1,2]. In our patient, there was excellent intrinsic sensing of the P-waves, and no lead extraction was required.

Signs and symptoms in these patients include pleuritic chest pain, shortness of breath, hypotension, or completely asymptomatic. The first step usually taken is a lead interrogation and chest radiography is the mainstay used to detect a pneumothorax [3,4]. However, in our case, the CT scan revealed the pneumothorax and contralateral pneumopericardium. Risk factors for perforation include variations in the right atrium structure, the number of attempts in placing the lead, and the lead design [1,5,6]. In our patient, there were three attempts at lead placement.

Due to the rarity of pneumothorax and contralateral pneumopericardium after pacemaker implantation, there's not a well-established management protocol [3,4,6]. Some patients may be treated with both a chest tube insertion and a lead extraction; however, conservative management may also be pursued [1,2,6]. Some patients may require a chest tube depending on the amount of air or blood leakage and the hemodynamic status of the patient [1]. If a pneumothorax involves greater than 10% of the pleura and if there was an associated hemopneumothorax, a chest tube should be inserted [1,2,6].

Conclusions

Our case demonstrated a successful outcome with conservative management, after a patient developed a pneumothorax and contralateral pneumopericardium after a dual chamber pacemaker insertion. Conservative treatment may be used as a treatment option depending on the patient's hemodynamic status, lead status and size of pneumothorax and pneumopericardium. However, the ideal management protocol for these patients would require further study.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Diva Maraj, Omair Ahmed, Muhammad Qureshi, Hussein Othman

Acquisition, analysis, or interpretation of data: Diva Maraj, Omair Ahmed, Muhammad Qureshi, Hussein Othman

Drafting of the manuscript: Diva Maraj, Omair Ahmed, Muhammad Qureshi, Hussein Othman

Critical review of the manuscript for important intellectual content: Diva Maraj, Omair Ahmed, Muhammad Qureshi, Hussein Othman

Supervision: Hussein Othman

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. van Rees JB, de Bie MK, Thijssen J, Borleffs CJ, Schalij MJ, van Erven L: Implantation-related complications of implantable cardioverter-defibrillators and cardiac resynchronization therapy devices: a systematic review of randomized clinical trials. *J Am Coll Cardiol*. 2011, 58:995-1000. [10.1016/j.jacc.2011.06.007](https://doi.org/10.1016/j.jacc.2011.06.007)
2. Hardzina M, Ząbek A, Boczar K, Matusik P, Małecka B, Lelakowski J: Contralateral pneumothorax after cardiac pacemaker implantation. *Postep Kardiol Inter*. 2015, 11:347-348. [10.5114/pwki.2015.55611](https://doi.org/10.5114/pwki.2015.55611)
3. Srivathsan K, Byrne RA, Appleton CP, Scott LR: Pneumopericardium and pneumothorax contralateral to venous access site after permanent pacemaker implantation. *Europace*. 2003, 5:361-363. [10.1016/s1099-5129\(03\)00093-x](https://doi.org/10.1016/s1099-5129(03)00093-x)
4. Nantsupawat T, Li JM, Benditt DG, Adabag S: Contralateral pneumothorax and pneumopericardium after dual-chamber pacemaker implantation: mechanism, diagnosis, and treatment. *HeartRhythm Case Rep*. 2018, 4:256-259. [10.1016/j.hrcr.2018.03.001](https://doi.org/10.1016/j.hrcr.2018.03.001)
5. Parashar NK, Deepti S, Yadav R, Sinha M, Ramakumar V: An unexpected complication of intracardiac device implantation: contralateral pneumothorax and pneumopericardium. *Indian Pacing Electrophysiol J*. 2019, 19:167-170. [10.1016/j.ipej.2019.04.001](https://doi.org/10.1016/j.ipej.2019.04.001)
6. Sebastian CC, Wu WC, Shafer M, Choudhary G, Patel PM: Pneumopericardium and pneumothorax after permanent pacemaker implantation. *Pacing Clin Electrophysiol*. 2005, 28:466-468. [10.1111/j.1540-8159.2005.40063.x](https://doi.org/10.1111/j.1540-8159.2005.40063.x)