

Pneumopericardium and Contralateral Pneumothorax to Venous Access Site after a Biventricular Permanent Pacemaker Implantation

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Abstract

A 79-year-old female underwent implantation of a left sided biventricular permanent pacemaker for symptomatic severe heart failure with active fixation leads. Twelve hours after the procedure, the patient complained of pleuritic chest pain and was found to have a 10-15% right pneumothorax on a thorax CT scan. Patient was managed conservatively, successfully relieving the symptoms. The CT scan of the chest also revealed extrusion of the helix of the screw-in atrial lead, through the wall of the right atrial appendage. The helix was adjacent to a bulla in the right lung, the likely cause for pneumothorax and pneumopericardium. The atrial lead was repositioned the following day without complications.

Keywords: Biventricular pacemaker; Atrial lead implantation; Contralateral pneumothorax; Pneumopericardium

Case Report

A 79-year-old female with chronic obstructive pulmonary disease and long-standing left bundle branch block due to ischaemic heart disease was electively admitted for a biventricular permanent pacemaker implantation. She also had a background of severe heart failure (HF) with reduced ejection fraction of $\leq 20\%$, and symptomatic New York Heart Association (NYHA) IV functional capacity despite optimal medical therapy. Electrocardiogram on admission showed prolonged QRS over 120 ms.

The patient underwent a biventricular permanent pacemaker combined with an implantable cardioverter-defibrillator (Medtronic Maximo II CRT-D, Medtronic, MN, U.S.A.) implantation using left subclavian venous access. Active fixation leads (Medtronic active fixation, Model 5176, Medtronic, MN, U.S.A.) were used for both atrial and ventricular pacing. Atrial lead pacing threshold was 1 V at 0.5 ms and pacing impedance 627 Ω . Sensed P wave was 3.4 mV. Right ventricular lead pacing threshold was 0.5 V at 0.5 ms, and pacing impedance 899 Ω . Sensed R wave was 9.0 mV. The coronary sinus lead paced the lateral wall of the left ventricle whose threshold was 0.9 V at 0.5 ms, and pacing impedance 1093 Ω . Sensed R wave was 9.0 mV. Pacemaker interrogation post procedure revealed normal sensing and pacing parameters in lead data. The initial chest X-ray

after implantation showed inadequate atrial lead position, however no evidence of pneumothorax was observed (Figure 1).

Twelve hours later, the patient complained of sudden onset thoracic chest pain and shortness of breath. A chest X-ray revealed no evidence of any pathology. Bedside transthoracic echocardiogram displayed severe left ventricle dysfunction with a small pericardial effusion (<0.5 cm) in the long parasternal axis view. Due to high clinical suspicion for contralateral pneumothorax, an urgent CT thorax was performed which revealed extrusion of the helix of the screw in atrial lead, through the wall of the right atrial appendage, causing a 10-15 % contralateral pneumothorax to venous access puncture. The helix of the atrial lead was adjacent to an intact bulla of the right lung and small pneumopericardium was also seen (Figure 2).

The patient was managed conservatively with parenteral analgesia, relieving the symptoms. Pacemaker interrogation revealed no change in lead data. The patient was taken to the electrophysiology laboratory for atrial lead extraction and repositioning. The post procedure chest X-ray showed adequate atrial lead position with small bilateral pleural effusion (Figure 3). The pneumopericardium and pleural effusion resolved within few days and the right pneumothorax also sealed and resolved gradually without complication.

Discussion

This interesting case illustrates a pneumopericardium and contralateral pneumothorax to venous access puncture after a biventricular pacemaker implantation.

Pneumothorax secondary to subclavian venous access is uncommon and occurs between 1 and 2% with experienced operators

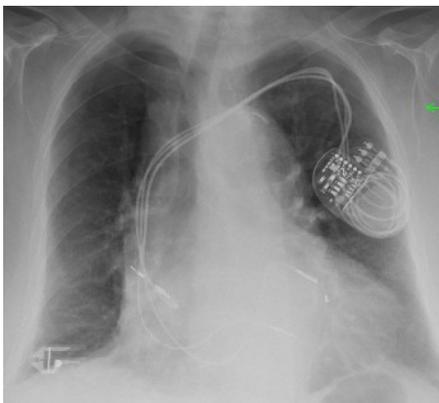


Figure 1: CXR after pacemaker implantation showing inadequate atrial lead pointing towards right middle lobe of lung (black arrow)

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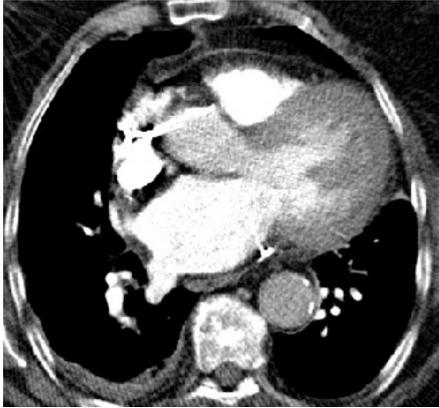


Figure 2: CT Thorax showing pneumothorax and pneumopericardium (black arrows).



Figure 3: CXR after lead repositioned showing adequate atrial lead (white arrow).

[1]. Pneumothorax may be detected during the procedure or within 24h after implantation. Unlike ipsilateral pneumothorax which is mostly a complication of the venous puncture, contralateral pneumothorax can only be caused by perforation of the cardiac wall, pericardium and pleura [2,3]. In this fascinating case we could clearly observe perforation of the atrial wall by the screw of the active fixation lead seen on a CT thorax. To our knowledge, contralateral pneumothorax after a biventricular pacemaker implantation combined with an implantable cardiac defibrillator or also called cardiac resynchronization therapy (CRT) has not been yet previously reported.

Several clinical trials [4-6] have shown that CRT implantation significantly improves HF hospitalizations, NYHA functional capacity and quality of life in patients with severe HF despite optimal medical therapy, poor LV function and QRS ≥ 120 ms on the ECG. However, the length of the procedure is longer than the conventional single or dual chamber pacemaker which could play a part in increasing the risk of developing any complications.

In our case, several risk factors may have contributed to the development of these rare complications caused by atrial lead perforation. Firstly, variation in patient anatomy such as an extremely thin walled or multilobed atrial appendage may play an important role. Secondly, lead factors such as design and stiffness of the helix may differ between manufacturers and could be of significance. Additionally, the length of a biventricular pacemaker procedure is longer than the conventional single or dual chamber pacemaker which could play a part in increasing the risk of developing serious complications during lead implantation. Finally, the experience of the operator is equally important to avoid over-screwing during atrial lead fixation.

In conclusion, this interesting case demonstrated a pneumopericardium and contralateral pneumothorax to venous access puncture after a biventricular pacemaker implantation due to a perforation of the atrial appendage during atrial lead implantation. In haemodynamically stable patients, CT scan of the chest is the investigation of choice. In unstable patients, emergency echocardiography may be useful to identify significant pericardial effusion. Extra post-procedural attention should be considered when implanting atrial leads in patients with bullous emphysema.

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