

Case	(275) Cardiac perforation: what to do?
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CASE PRESENTATION

52-year-old male with history of cardiac arrest and dual-chamber permanent pacemaker implantation one week ago. Now presenting to the Emergency Department with left-sided chest pain and palpitations. X-ray showed dislocation of the right ventricle (RV) lead into the retrosternal space.

Echocardiography was nondiagnostic due to limited acoustic window. EKG-gated Cardiac CT (CTC) was performed to exclude cardiac perforation, confirming malpositioning of the wire through the free wall of the RV, pericardium and mediastinal fat into the left pleural space causing pneumomediastinum and left pneumothorax.

No pericardial effusion was seen. Patient was admitted for successful lead repositioning under fluoroscopic and echocardiographic guidance. No surgery was performed.

DISCUSSION

Subacute onset complications after pacemaker insertion are extremely rare (0,06%). Active lead fixation demonstrates less complications compared to passive lead fixation.

Pneumothorax, pneumomediastinum, pleural and pericardial effusion, valvular injury or cardiac tamponade have been described. Clinical presentation is variable, sometimes even asymptomatic, being chest pressure the most frequent symptom. Risk factors for cardiac perforation are: excessive wire tension, looping, or myocardial wall thinning from previous infarcts.

Hence, perforation occurs more frequently in the atria, right ventricle, with low incidence in the left ventricle. If the tip of the wire locates less than 3 mm from the epicardial fat it is called penetration. If the tip locates in the epicardial fat then it is considered perforation. Imaging study should start with frontal and lateral chest X-ray to assess the integrity and location of the pacemaker wires¹.

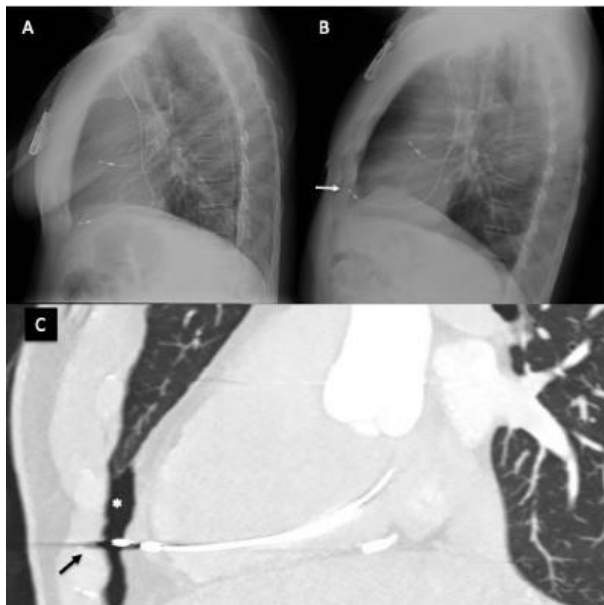
Echocardiography is diagnostic and therapeutic in case of cardiac tamponade that requires urgent pericardiocentesis but correct evaluation of the RV apex is sometimes difficult and does not allow a thorough evaluation of the lungs either². CTC is the gold standard technique to exclude major complications.

Our protocol consists of EKG-gated retrospective acquisition with double intravenous contrast injection: first bolus of 80mL of iodinated contrast media (350 mg/mL) followed by 30mL of 50% concentration (15mL contrast + 15mL saline) to opacify right cavities, both at 5 mL/sec. CT streak artifact caused by hardening of the beam due to the high

density of the metallic tip is a limitation of the technique. Increasing the kilovoltage or using beam hardening correction software is recommended to avoid it.

CONCLUSION

Pacemakers are widespread cardiac devices. Radiologists should be aware of their complications and how to manage imaging studies. Diagnostic algorithm starts with X-ray and is followed by echocardiography. When echocardiography is uncertain, EKG-gated CTC is the gold standard technique to exclude complications.



A. Lateral chest radiograph acquired after insertion of dual-chamber pacemaker.
B. Lateral chest radiograph one week later shows inferior electrode tip displacement (white arrow).
C. EKG-gated Cardiac CT demonstrates the fixation lead anomalous positioning through the right ventricle wall into the left pleural space causing small pneumothorax (asterisk). Streak artifact is also noticed around the pacemaker tip (black arrow).

BIBLIOGRAPHY

- Aguilera AL, Volokhina YV. Radiography of Cardiac Conduction Devices: A comprehensive Review. *RadioGraphics*, 2011; 31:1669–1682.

- Boxma RPJ, Kolff-Kamphuis MGM, Gevers RMM, Boulaksil M. Subacute right ventricular pacemaker lead perforation: evaluation by echocardiography and cardiac CT. *J Echocardiogr*, 2017; 15:188–190.