Cardiac Tamponade after Right Ventricular Perforation Caused by Screw-in Lead

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Abstract

Keywords

- cardiac tamponade
- right ventricular perforation
- pacemaker
- screw-in lead
- complications
- pericardial drainage
- multislice computed tomography

A 69-year-old man was admitted after syncope followed with chest pain and signs of cardiac tamponade. He had undergone permanent dual-chamber pacemaker implantation 3 weeks earlier. Transthoracic echocardiography (TTE) confirmed a pericardial effusion, and urgent pericardial drainage was performed. Right ventricular perforation caused by active-fixation (screw-in) lead was verified by multislice computed tomography. The lead was extracted under fluoroscopy and bedside TTE monitoring in the operating room with cardiothoracic surgery backup. In the same act, the new ventricular passive-fixation lead was implanted.

Some cardiac arrhythmias are effectively treated by implantation of permanent pacemakers. Although the likelihood of a complication is low, some of them can be life threatening.¹ One of these certainly is cardiac perforation caused by pacemaker's lead. However, it is a rare complication, and appropriate management is still uncertain. In most cases, perforation occurs within 1 month of implantation, while late perforation is much less common. We present a patient who has experienced cardiac tamponade 3 weeks after implantation of permanent pacemaker.

Case Presentation

A 69-year-old man was transferred to our department from 70 km far General Hospital after syncope followed with chest pain and signs of cardiac tamponade. He was hypotensive, with distended jugular veins and upper body cyanosis. Twenty-two days earlier, due to intermittent atrioventricular

third-degree block, he underwent implantation of a permanent dual-chamber pacemaker (Taloz DR, Biotronik, Berlin, Germany) with the following fixation leads (atrial: Setrox S 53, Biotronik; ventricular: Medtronic 5076 [Reading, UK], 58 cm). Transthoracic echocardiography (TTE) confirmed a pericardial effusion, and urgent pericardiocentesis via 6-Fr multiple-hole flexible 30-cm-long catheter, through subxiphoid approach, was performed. A total of 560 mL of hemorrhagic pericardial fluid was evacuated. Since the TTE showed residual circumscript, pericardial effusion of 1.4 cm in diastole catheter was exchanged for 8.2-Fr multiple-hole flexible 20-cm-long catheter. The chest X-ray revealed enlarged cardiac silhouette, yet the lead dislocation was not highly suspicious (►Fig. 1A). Due to pacing failure of ventricular electrode, patient further underwent fluoroscopic examination where a suspicion on lead perforation was set. Cardiac multislice computed tomography (MSCT) confirmed right ventricular perforation caused by screw-in lead with the

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Fig. 1 (A) Chest X-ray after insertion of a pericardial catheter (arrow). (B) Cardiac MSCT shows a ventricular lead tip (arrow) placed in the pericardial effusion (PE).

lead tip placed in the pericardial effusion (► **Fig. 1B**). In the upcoming days, extension of pericardial effusion was followed with repetitive TTE. One week later, after confirmed regression of the effusion, the lead explantation was scheduled. Lead was explanted under fluoroscopy and bedside TTE monitoring in the operating room with cardiothoracic surgery backup. In the same act, the new ventricular passive-fixation lead (Selox ST 60, Biotronik) was implanted (► **Fig. 2A**). During the whole procedure, the patient was hemodynamically stable, and for the remainder of hospitalization, multiple TTE tests were made to follow the dynamics of the effusion. Five days later, he was discharged with correct pacemaker function and minimal pericardial effusion (► **Fig. 2B**). He had normal recovery and was well during 18 months follow-up.

Discussion

Myocardial perforation caused by pacemaker lead is a rare complication with the incidence ranging from 0.3 to 1.2%. Most of the perforations occur within 30 days of implantation and are more often caused by active-fixation

leads.²⁻⁵ Possible mechanisms explaining active-fixation lead perforation are as follows: thin myocardial wall, pressure upon patches of inflammatory myocardial diseases, and overturning of the electrode's helix. We believe that some perforations could possibly be related to release of "hidden energy" stored in the overturned pacemaker lead as a result of rough manipulation during the procedure. Clinical presentation of myocardial perforation may vary widely from asymptomatic, palpitations, dyspnoea, chest pain, syncope, tamponade, up to sudden cardiac death. Therefore, to setup the correct diagnosis, the suspicion of lead perforation should be highlighted. Medical history, physical examination, electrocardiogram, chest X-ray, TEE, fluoroscopy, and pacemaker analyzer checkup can be helpful to determine the diagnosis, and the definitive diagnosis should be confirmed by cardiac MSCT.⁶ Treatment options are similar in many medical centers. In case of cardiac tamponade, urgent pericardiocentesis is mandatory. Extraction and replacement of perforating screw-in leads should be done in the operating room under fluoroscopy and TTE observation with the cardiac surgery backup.^{6,7} Open chest surgery as a more aggressive and

Fig. 2 (A) TTE shows correct position of new implanted lead. LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle; pacemaker lead (arrow). (B) TTE shows residual pericardial effusion (arrow). L, liver; H, heart.

expensive method is rarely needed and should be left as a last treatment option. To prevent this complication, it is necessary to comply with the manufacturer's recommendations for implantation of the electrodes, and especially not to exceed recommended number of rotations for the extension of the screw. Implanting the electrode in a septal wall and advising the patient not to carry heavy objects or undertake vigorous tasks within the month after implantation is also suggested.^{8,9}

Conclusion

Cardiac tamponade after right ventricular perforation caused by screw-in lead in some patients may demand only pericardial drainage, and simple removal and replacement of the electrode followed by serial echocardiography.

Conflict of Interest

None.

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References

- 1 Kiviniemi MS, Pirnes MA, Eränen HJ, Kettunen RV, Hartikainen JE. Complications related to permanent pacemaker therapy. *Pacing ClinElectrophysiol* 1999;22(5):711–720
- 2 Mahapatra S, Bybee KA, Bunch TJ, et al. Incidence and predictors of cardiac perforation after permanent pacemaker placement. *Heart Rhythm* 2005;2(9):907–911
- 3 Sterliński M, Przybylski A, Maciag A, et al. Subacute cardiac perforations associated with active fixation leads. *Europace* 2009;11(2):206–212
- 4 Geyfman V, Storm RH, Lico SC, Oren JW IV. Cardiac tamponade as complication of active-fixation atrial lead perforations: proposed mechanism and management algorithm. *Pacing ClinElectrophysiol* 2007;30(4):498–501
- 5 Trigano AJ, Taramasco V, Paganelli F, Gerard R, Lévy S. Incidence of perforation and other mechanical complications during dual active fixation. *Pacing ClinElectrophysiol* 1996;19(1 Pt 2):1828–1831
- 6 Khan MN, Joseph G, Khaykin Y, Ziada KM, Wilkoff BL. Delayed lead perforation: a disturbing trend. *Pacing ClinElectrophysiol* 2005;28(3):251–253
- 7 Henrikson CA, Leng CT, Yuh DD, Brinker JA. Computed tomography to assess possible cardiac lead perforation. *Pacing ClinElectrophysiol* 2006;29(5):509–511
- 8 Amara W, Cymbalista M, Sergeant J. Delayed right ventricular perforation with a pacemaker lead into subcutaneous tissues. *Arch Cardiovasc Dis* 2010;103(1):53–54
- 9 Bigdeli AK, Beiras-Fernandez A, Kaczmarek I, Kowalski C, Schmoedel M, Reichart B. Successful management of late right ventricular perforation after pacemaker implantation. *Vasc Health Risk Manag* 2010;6:27–30