

Case report: recurrent thrombosis of an old lead of a DDDR pacemaker mimicking lead infection

Margos N. Panagiotis*, Margos P. Nikolaos, Goranitou St. Georgia, and Kranidis I. Athanasios

1st Cardiology Department, General Hospital of Nikea Ag. Panteleimon, Mantouvalou 3, Nikea Attikis 18453, Greece

Received 12 February 2018; accepted 5 May 2018; online publish-ahead-of-print 26 May 2018

Introduction

Thrombosis of the intracardiac part of a permanent pacemaker lead, which is usually detected during a routine transthoracic echocardiographic examination, can be totally asymptomatic. The differential diagnosis between intracardiac lead thrombosis and vegetation is crucial, especially in febrile patients, as these two situations are totally different regarding prognosis and treatment.

Case presentation

We describe the case of an 85-year-old patient with a dual chamber pacemaker (DDDR) due to complete heart block, who was admitted twice, within 2 years, with vegetation-like masses attached to the ventricular lead of the pacemaker. Infective endocarditis was not documented (diagnostic criteria were not fulfilled), although clinical suspicion was high during both hospitalizations. Masses resolved under applied treatment (anticoagulation) in both cases.

Discussion

Differential diagnosis between lead thrombosis and vegetation was ambiguous in both hospitalizations. The ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography during the 2nd hospitalization excluded a possible inflammatory origin of the masses.

Keywords

Case report • Endocarditis • Thrombus • Pacemaker lead • Positron emission tomography

Learning points

- Pacemaker-lead thrombosis, mainly asymptomatic, may be detected by echocardiography a long time after implantation of a permanent pacemaker.
- The ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography is a useful technique to confirm or exclude the inflammatory cause of a mass attached to the pacemaker lead.

Introduction

Pacemaker-lead thrombosis is considered uncommon. The differential diagnosis from lead infection (vegetation) is challenging. Echocardiography cannot reliably differentiate the thrombotic or infective origin of the masses.^{1,2} The ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F -FDG PET/CT) has emerged as a valuable imaging technique to confirm or exclude intracardiac infection in patients with implanted cardiac electronic devices.³

* Corresponding author. Tel: 00302132077302, Fax: 00302132077352, Email: pmargos@yahoo.gr. This case report was reviewed by Riccardo Liga and Rami Riziq Yousef Abumuaileq.

© The Author(s) 2018. Published by Oxford University Press on behalf of the European Society of Cardiology.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com

Timeline

25 years earlier	Initial pacemaker implantation (DDDR)
6 months before 1st hospitalization	Uncomplicated generator replacement
1st hospitalization	Vegetation-like masses on the atrial portion of the ventricular lead (finding in routine echo). Endocarditis criteria not fulfilled. Patient discharged on acenocoumarol
1 month after 1st hospitalization	Masses not present on follow-up echo
2nd hospitalization (over 2 years later)	Fever, reappearance of the vegetation-like masses at the same site. Endocarditis criteria not clearly fulfilled. ¹⁸ F-fluorodeoxyglucose positron emission tomography/computed tomography excluded the inflammatory origin of the masses. Patient discharged on acenocoumarol
1 month after 2nd hospitalization	Masses not present on follow-up echo
6 months after 2nd hospitalization	Masses not present on follow-up echo

Case presentation

An 85-year-old man with a permanent DDDR pacemaker (implanted 25 years ago due to complete heart block) was admitted for differential diagnosis and treatment of a right atrial mass, revealed in a routine transthoracic echocardiogram (TTE), which was performed on an outpatient basis, for the evaluation of dyspnoea on exertion (New York Heart Association III stage). The patient had a prior medical history of arterial hypertension and three-vessel coronary artery disease under medical treatment. Coronary angiography was performed 2 years ago. Percutaneous coronary artery angioplasty was not feasible due to the complexity of the atheromatic lesions and the patient refused any surgical treatment. Six months prior to this hospitalization, he had undergone uncomplicated generator replacement due to battery depletion. On admission, the patient was afebrile with a heart rate of 60 b.p.m. and blood pressure 120/65 mmHg. The ECG showed pacing rhythm, and he was pacemaker-dependent. Physical examination of the heart, lung, and abdomen revealed no abnormalities and there were no signs of localized infection at the pacemaker pocket site.

Biochemical examinations (red and white blood cells count, C-reactive protein and erythrocyte sedimentation rate, liver function tests, thyroid function tests, urine analysis, and plasma markers of coagulation) were within normal range. The interrogation of the device revealed normal findings.

The TTE showed the left and right ventricle within normal size and contractility range. The apical four chamber view (Figure 1A and B) revealed clearly two mobile masses (32 mm and 19 mm long) with a common stem, of low echogenicity and elliptical shape, attached to the ventricular lead of the pacemaker, prolapsing through the tricuspid valve in systole (ventricular lead type: Medtronic 4043–58, passive fixation, bipolar). Contrast-enhanced chest and computed tomography showed a pulmonary infarct in the right upper lobe. A Doppler study of the upper and lower extremity veins did not show any thrombi.

The patient was held on low molecular heparin (LMWH). Three sets of blood cultures and urine culture were negative. The patient remained in-hospital for a close echocardiographic follow-up and for the final identification of all blood cultures. Ten days after his admission, he presented low grade fever up to 37.5°C, normal white blood cell count and C-reactive protein at 70 mg/L (normal range <3 mg/L). A positive urine culture of *Escherichia coli* was detected. After 2 weeks of antimicrobial treatment (ciprofloxacin 200 mg bid) and under LMWH the patient was afebrile, with normal inflammatory markers and small decrease of the size of the cardiac masses in the TTE.

The patient was discharged on acenocoumarol. A TTE after 1 month did not visualize the cardiac masses (Figure 1C). Acenocoumarol with a goal INR of 2.0–2.5 was recommended to be continued for an additional 3 month period. After discontinuation of acenocoumarol, the patient received aspirin 100 mg daily, due to the coexisting coronary artery disease.

The patient did not receive any other anticoagulant or antiplatelet therapy and did not attend any other scheduled follow-up appointments.

Over 2 years after his 1st admission, the patient, without anticoagulant therapy anymore, was readmitted to our clinic due to a 7-day history of fever up to 38.5°C. Once more, physical examination revealed no signs of localized infection.

The TTE revealed two new vegetation-like masses, possibly attached to the same site of the ventricular lead. Transoesophageal echocardiogram (TOE) confirmed clearly the existence of the masses approximately of the same size as in the 1st hospitalization and their attachment to the pacemaker lead (Figure 2). Once more, most of the biochemical examinations (red blood cells count, erythrocyte sedimentation rate, liver function tests, thyroid function tests, urine analysis, and plasma markers of coagulation) were within normal range, with only slight elevation of white blood cells count [11 000/μL (normal range 4000–9000/μL), 76% PMN (normal range 50–80%), and C-reactive protein (23 mg/L)]. Two out of five blood cultures yielded *Staphylococcus epidermidis*. Contrast-enhanced chest computed tomography showed no pulmonary infarcts. The patient was held on vancomycin 2 g daily and meropenem 1 g daily, combined with LMWH (enoxaparin 60 mg bid). Differential diagnosis between contaminated thrombus and vegetation was challenging. However, ¹⁸F-FDG PET/CT scan, which was performed 2 days after admission, demonstrated increased uptake of ¹⁸F-FDG in the outer part of the middle pulmonary lobe and in the sigmoid colon (Figure 3). The diagnosis of vegetation was excluded and lead thrombosis was confirmed once more (relapse). Antibiotics were discontinued. A sigmoidoscopy was performed, which revealed polyposis of the sigmoid colon. Endoscopic polypectomy was performed one

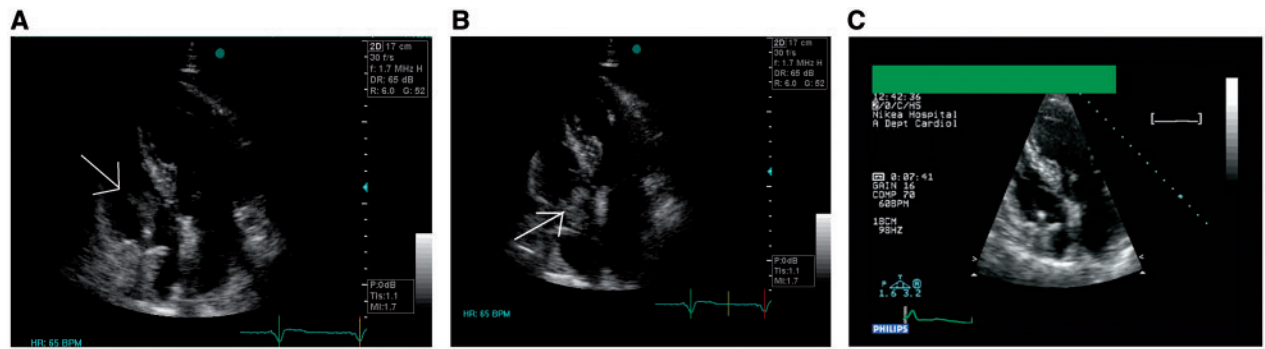


Figure 1 First hospitalization: transthoracic echocardiogram apical four-chambers view: (A) two masses with a common stem (arrows) attached to the pacemaker lead, (B) prolapsing through tricuspid valve at systole, and (C) 1 month after 1st hospitalization, no mass was detected.

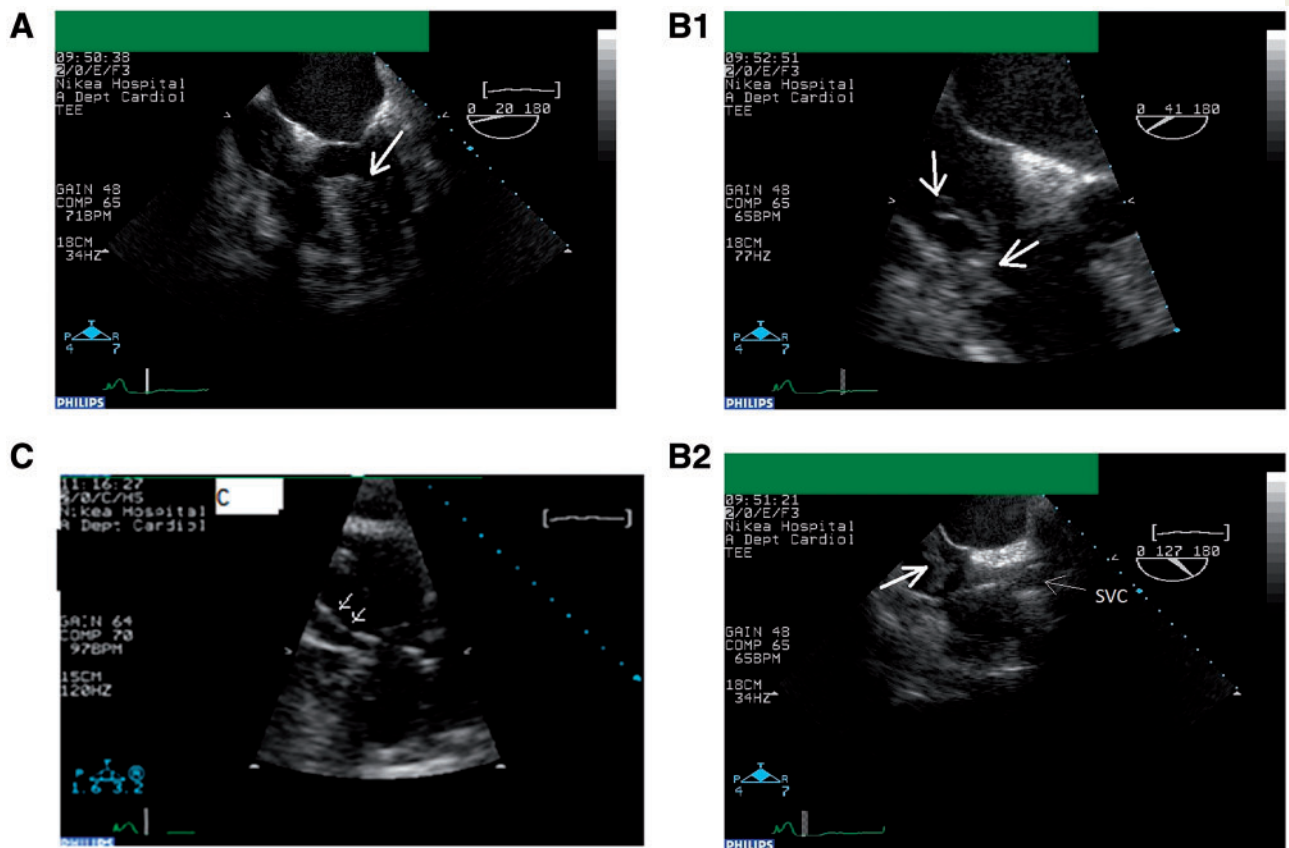


Figure 2 Second hospitalization: transoesophageal echocardiogram: (A) mid-oesophageal five-chamber view showing the masses attached to the ventricular lead (arrow) prolapsing in the right atrium at systole, (B1) modified mid-oesophageal short-axis view showing the two leads (arrows) and the masses attached to the ventricular lead, (B2) modified mid-oesophageal bicaval view showing the lead through superior vena cava and the two masses with a common stem (wide arrow) in the right atrium, and (C) transthoracic echocardiogram apical four-chambers view showing the ventricular lead without the masses (arrows) after anticoagulant treatment.

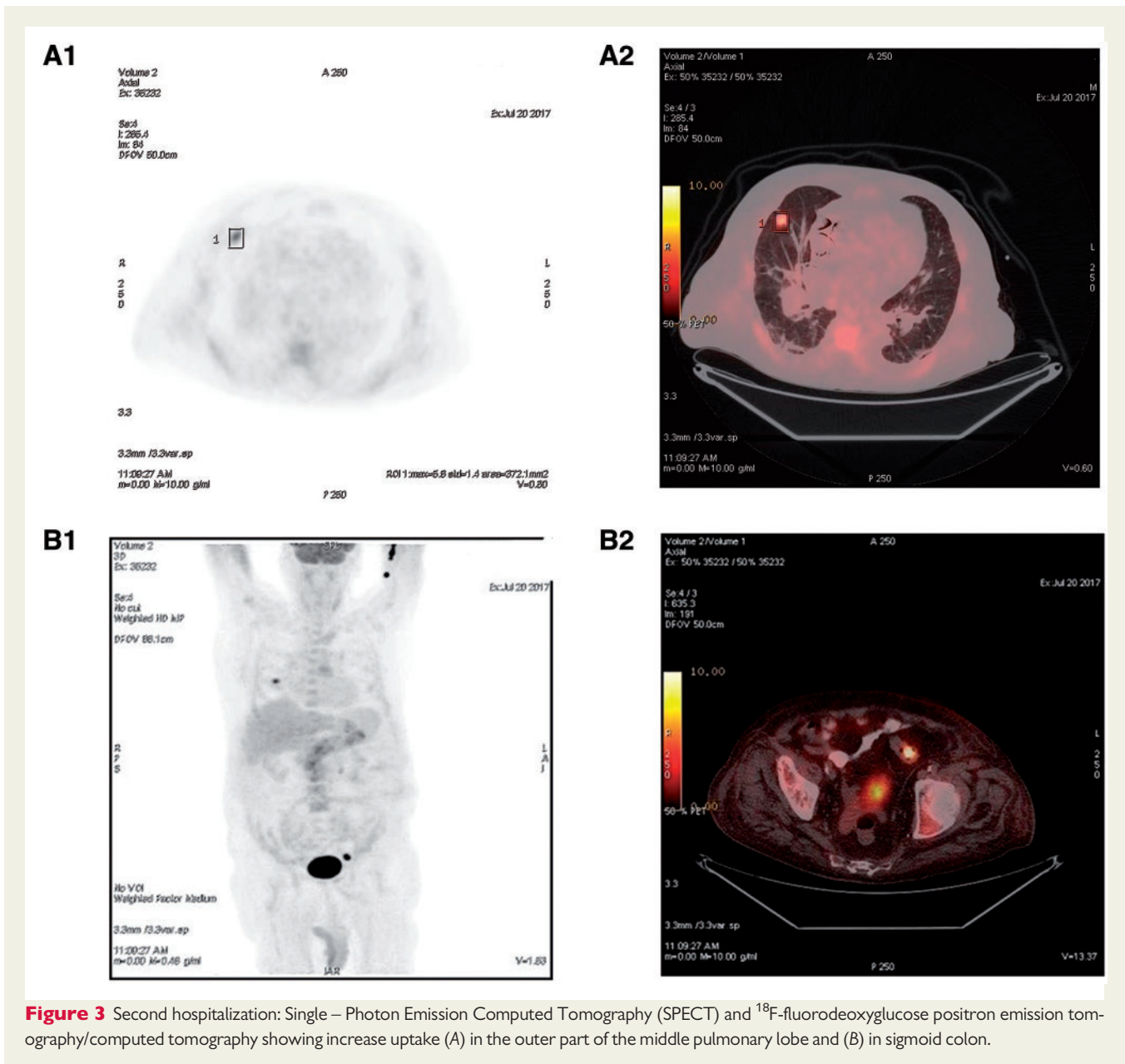


Figure 3 Second hospitalization: Single – Photon Emission Computed Tomography (SPECT) and ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography showing increase uptake (A) in the outer part of the middle pulmonary lobe and (B) in sigmoid colon.

month afterwards. At that time, the TOE echocardiogram revealed total resolution of the masses (Figure 2B).

Since then, the patient remains asymptomatic on acenocoumarol therapy with a goal INR of 2.0 – 2.5, with no detectable intracardiac masses in a follow-up TTE, 6 months after his 2nd hospitalization. Repeated device interrogation did not detect any dysfunction. Of note, no atrial tachyarrhythmia was ever detected.

Discussion

Lead-associated thrombosis in patients with cardiac implantable devices is considered uncommon. In a recent study, the incidence was 1, 4% among 1086 such patients, who underwent TTE.⁴ The TOE can visualize better the route of the leads in the right atrium and the superior vena cava.

The aetiology of lead thrombosis is still ambiguous. Thrombus formation on the intra-vein course of pacemaker leads may be based on a foreign-body type reaction, followed by inflammation and fibrosis.⁵ Several thrombus formation risk-factors have been reported, such as heart failure, atrial fibrillation, coagulopathies, thrombocytopenia, polycythaemia, and silicone pacemaker leads.^{6–9} Thrombus attached to pacemaker leads maybe asymptomatic or presented with various symptoms such as acute congestive heart failure, shock, chest pain, malaise, cyanosis, and fever.^{10–13} In several studies, the incidence of symptomatic pulmonary embolism in patients with lead thrombosis was quite low (0–5%), while asymptomatic or subclinical PE was found up to 48%.¹⁴

In our patient, lead masses were detected in both cases by TTE, due to their large size and the limited shadowing artefact of the pacemaker leads.

Transoesophageal echocardiogram did not contribute further to differential diagnosis. The clinical course under anticoagulation provided the definite diagnosis of lead thrombosis (mass disintegration without complications—therapeutic criterion). The re-detection of similar lead-attached masses after 2 years, is quite remarkable (reformation may have occurred quite earlier than detection time). During 2nd hospitalization the clinical suspicion for pacemaker-lead infection was high. Diagnosis was challenging once more.

Meanwhile, revised ESC guidelines of infective endocarditis¹⁵ demonstrated that ¹⁸F-FDG PET/CT is a strong additive diagnostic tool in cases of <possible> endocarditis of prosthetic valves.

Regarding IE of pacemaker and defibrillation leads, ¹⁸F-FDG PET/CT was not included in the diagnostic criteria due to insufficient data. In our patient, ¹⁸F-FDG PET/CT was the only remained diagnostic tool and successfully excluded the presence of inflammatory lead vegetation. The administration of antibiotics for only 2 days before PET should not reduce the diagnostic accuracy of ¹⁸F-FDG PET/CT scan, as it is well known that infective endocarditis with large vegetations is a severe infection, requiring a quite long period of treatment with antibiotics (or even surgical treatment). In agreement with the above point of view, the benign clinical course of the 2nd hospitalization totally excludes the possibility of a false negative ¹⁸F-FDG PET/CT scan. Nevertheless, the finding of lung uptake for FDG cannot be interpreted reliably.

Except advanced age, there were no other apparent provokable cause of that recurrent thrombosis.

In conclusion, this report shows that (i) pacemaker-lead thrombosis, mainly asymptomatic, may be detected by echocardiography a long time after implantation of a permanent pacemaker, (ii) lead thrombosis may also relapse, after initial but no continued anticoagulant therapy, and (iii) The ¹⁸F-FDG PET/CT is a useful technique to confirm or exclude the inflammatory cause of a mass attached to the pacemaker lead.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

References

- Sandoe JAT, Barlow G, Chambers JB, Gammage M, Guleri A, Howard P, Olson E, Perry JD, Prendergast BD, Spry MJ, Steeds RP, Tayebjee MH, Watkin R. Guidelines for the diagnosis, prevention and management of implantable cardiac electronic device infection. Report of a joint Working Party project on behalf of the British Society for Antimicrobial Chemotherapy (BSAC, host organization), British Heart Rhythm Society (BHRS), British Cardiovascular Society (BCS), British Heart Valve Society (BHVS) and British Society for Echocardiography (BSE). *J Antimicrob Chemother* 2015;**70**:325–359.
- Almomani A, Siddiqui K, Ahmad M. Echocardiography in patients with complications related to pacemakers and cardiac defibrillators. *Echocardiography* 2014;**31**:388–399.
- Sarrazin J, Philippon F, Trottier M, Tessier M. Role of radionuclide imaging for diagnosis of device and prosthetic valve infections. *World J Cardiol* 2016;**8**:534–546.
- Rahbar AS, Azadani PN, Thatipelli S, Fleischmann EK, Nguyen N, Lee BK. Risk factors and prognosis for clot formation on cardiac device leads. *Pacing Clin Electrophysiol* 2013;**36**:1294–1300.
- Korkeila P, Mustonen P, Koistinen J, Nyman K, Ylitalo A, Karjalainen P, Lund J, Airaksinen J. Clinical and laboratory risk factors of thrombotic complications after pacemaker implantation: a prospective study. *Europace* 2010;**12**:817–824.
- Buttigieg J, Ascikan R, Azzopardi C. Pacemaker lead-associated thrombosis in cardiac resynchronization therapy. *BMJ Case Rep* 2015; doi:10.1136/bcr-2015-210314.
- Janssens U, Breithardt OA, Greinacher A. Successful thrombolysis of right atrial and ventricle thrombi encircling a temporary pacemaker lead in a patient with heparin-induced thrombocytopenia type II. *Pacing Clin Electrophysiol* 1999;**22**:678–681.
- Hendler A, Krakover R, Stryjer D, Schlesinger Z. A right atrial mass in the presence of a permanent pacemaker electrode in a patient with polycythemia vera. *Pacing Clin Electrophysiol* 1991;**14**:2083–2085.
- Palatianos GM, Dewanjee MK, Panoutsopoulos G, Kapadvanjwala M, Novak S, Sfakianakis GN. Comparative thrombogenicity of pacemaker leads. *Pacing Clin Electrophysiol* 1994;**17**:141–145.
- Coleman DB, DeBarr DM, Morales DL, Spontitz HM. Pacemaker lead thrombosis treated with atrial thrombectomy and biventricular pacemaker and defibrillator insertion. *Ann Thoracic Surg* 2004;**78**:e83–e84.
- Karavidas A, Lazaros G, Matsakas E, Kouvousis N, Samara C, Christoforatu E. Early pacemaker lead thrombosis leading to massive pulmonary embolism. *Echocardiography* 2004;**21**:429–432.
- Wierzbowska K, Krzeminska-Pakula M, Marszal-Marciniak M, Drodz J, Zaslonka J, Kasprzak JD. Symptomatic atrial pacemaker lead thrombosis: detection by echocardiography and successful surgical treatment. *Pacing Clin Electrophysiol* 2001;**24**:391.
- Schifter DR, Kozler LM, Saul BI, Reddy CV. An unusual case of multiple right atrial thrombi in a patient with a dual-chamber pacemaker—a case report. *Angiology* 1999;**50**:855–858.
- Noheria A, Ponamgi SP, Desimone CV, Vaidya VR, Aakre CA, Ebrille E, Hu T, Hodge DO, Slusser JP, Ammash NM, Bruce CJ, Rabinstein AA, Friedman PA, Asirvatham SJ. Pulmonary embolism in patients with transvenous cardiac implantable electronic device leads. *Europace* 2016;**18**:246–252.
- Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta J-P, Del Zotti F, Dulgheru R, El Khoury G, Erba PA, lung B, Miro JM, Mulder BJ, Plonska-Gosciniak E, Price S, Roos-Hesselink J, Snygg-Martin U, Thuny F, Tornos Mas P, Vilacosta I, Zamorano JL. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). *Eur Heart J* 2015;**36**:3075–3128.