

How Sweet is the pacemaker?

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ABSTRACT Pacemaker infections can be difficult to diagnose, especially when they present with non-specific symptoms and signs a long time after insertion of the device. Unidentified or partially treated low-grade chronic sepsis can result in multisystem disease processes with significant mortality and morbidity. Therefore, a high index of suspicion is required to identify the pacemaker as the source of sepsis and treat it effectively. This report describes a case of chronic pacemaker wire infection, which eventually presented with Sweet's syndrome, a rare manifestation of infective endocarditis.

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CASE REPORT

A 65-year-old man was admitted with increasing breathlessness. He had an extensive past medical history which included two previous myocardial infarctions and had a dual chamber pacemaker inserted three days after his second myocardial infarction for sick sinus syndrome. He also had chronic obstructive pulmonary disease and bronchiectasis requiring home oxygen that limited his exercise tolerance to about ten yards. He suffered from moderate renal impairment and required erythropoietin for anaemia of chronic disease. Over the preceding three years (starting approximately one year after a pacemaker-box change), he had been admitted 11 times feeling generally 'unwell' with persistently raised inflammatory markers. No definitive diagnosis had been reached and he was discharged home on each occasion following a short course of broad spectrum antibiotics. More recently he had developed an intermittent rash which had been biopsied, confirming Sweet's syndrome.

On the index admission he again complained of feeling breathless and generally unwell. Clinical examination revealed normal cardiac sounds with reduced air entry and bronchial breathing on the left side of the chest. Blood biochemistry showed elevated C-reactive protein (136 mg/L [normal <10 mg/L]), haematology tests revealed anaemia (haemoglobin 90 g/L [130–180 g/L]) and neutrophilia ($10.4 \times 10^9/L$) with left shift. He was initially treated with intravenous co-amoxiclav and oral clarithromycin according to the hospital guidelines for community acquired pneumonia. He also received a

transfusion of two units of packed red blood cells and his symptoms slowly improved.

Ten days into admission, he deteriorated with rapidly worsening breathlessness, hypotension, tachycardia and elevated jugular venous pressure. Urgent transthoracic echocardiography confirmed a large pericardial effusion with right ventricular diastolic collapse and he underwent emergency pericardiocentesis to relieve the haemodynamic instability. He required transient haemofiltration because of oliguria and acute-on-chronic kidney injury. We suspected that the pericardial effusion was secondary to infection even though microbiological analysis of the pericardial fluid did not identify any organisms. Twenty-eight days into admission, a rash was noted affecting both legs (Figure 1a, b) raising the possibility of vasculitis as a unifying diagnosis. A search for vasculitis, however, revealed negative antinuclear antibodies and negative antineutrophil cytoplasmic antibodies, negative mesenteric angiography for polyarteritis nodosa, negative haemolysis screen and normal bone marrow aspirate. With supportive treatment he made a slow recovery but 51 days into admission his temperature rose to 38.6°C.

Another set of blood cultures was taken and empirical antibiotics were commenced. This set of blood cultures grew coagulase negative staphylococci and review of all previous microbiology records revealed a further seven sets of blood cultures growing coagulase negative staphylococci in the preceding two years with the same sensitivities as the current one. A



FIGURE 1 Figures 1a (left) and b (right) showing a rash which prompted a search for vasculitis

diagnosis of chronic pacemaker lead endocarditis was therefore considered. Transthoracic and transoesophageal echocardiography could not rule out pacemaker wire infection as the entire lead could not be visualised, but did not demonstrate any valvular pathology. With a working diagnosis of chronic pacemaker lead endocarditis, after extensive discussions between microbiologists and a cardiologist specialising in explanting devices, the patient was treated with intravenous vancomycin and oral rifampicin for six weeks. The pacemaker was explanted upon antibiotic completion as there were concerns that further pacemaker implantation before this would have been associated with higher re-infection risk, even if implantation was on the contralateral site.

At his last follow-up in clinic, two years after discharge from hospital, the patient was doing well and had not had any further hospital admissions. The anaemia improved, his renal function normalised and he no longer required erythropoietin. Furthermore, his chronic obstructive pulmonary disease and bronchiectasis improved significantly to the point where home oxygen was no longer required. This suggests that low-grade, partially treated chronic sepsis was responsible for his multisystem deterioration.

DISCUSSION

Sweet's syndrome or acute febrile neutrophilic dermatosis, is characterised by a combination of fever,

neutrophilia, tender erythematous skin lesions and a diffuse infiltrate of upper dermis consisting mainly of mature neutrophils.¹ It can be idiopathic (usually preceded by upper respiratory tract infections) or associated with malignancy and drugs.¹ Sweet's syndrome is a rare manifestation of infective endocarditis.² Endocarditis should be considered in all patients with Sweet's syndrome and evidence of infection for which there is no alternative source determined. Our patient has demonstrated that the combination of pacemaker, Sweet's syndrome and evidence of infection should prompt an early search for pacemaker wire infection. Furthermore, a vasculitic rash can also be a rare manifestation of infective endocarditis and therefore one should resist the temptation to offer steroids to patients with a vasculitic-looking rash prior to obtaining further evidence supporting a vasculitic process, particularly if there is any concern about endocarditis.³

Pacemaker infection is common, occurring in 1–19% of pacemaker implantations.^{4,5} Coagulase negative staphylococci (often considered a contaminant or apathogenic in patients without indwelling devices⁶), *Staphylococcus aureus* and gram-negative bacilli (e.g. *Klebsiella pneumoniae*, *Serratia marcescens* and *Pseudomonas aeruginosa*)^{7,8} are the most common pathogens. Fungi are rarely implicated. In the context of implanted devices, coagulase negative staphylococci should not be considered apathogenic organisms or contaminants but should prompt a search to identify the source of infection. In our case, the patient's multisystem

deterioration and multiple hospital admissions started to appear one year following his first pacemaker-box change.

Subsequent to our case, updated European and North American guidelines have been published.^{9,10} These now recommend explantation as soon as possible following confirmation of infection with a subsequent prolonged period of antibiotic therapy. The vast majority of patients will be best managed by early extraction of the device and therefore it is crucial to have continuous and thorough discussions with the microbiology and cardiology teams to best optimise management for each patient. Decisions should be tailored as to whether further device therapy is warranted and, if so, when, depending on the underlying rhythm, associated haemodynamics and response to antibiotic therapy.

According to current guidance,⁹ temporary pacemaker insertion is no longer recommended in such cases. In our patient, close monitoring in hospital and multiple heart monitors following the pacemaker extraction revealed normal sinus rhythm with no indication to necessitate further pacemaker implantation. The pacemaker was initially inserted three days after an inferior myocardial infarction and sick sinus syndrome. It seems that the patient's own rhythm improved since pacemaker implantation as it took 14 years before he needed his first box change. This is commonly observed in a third of devices extracted.^{7,10}

REFERENCES

- 1 Cohen PR. Sweet's syndrome – a comprehensive review of acute febrile neutrophilic dermatosis. *Orphanet J Rare Dis* 2007; 2: 34.
- 2 Arias IM, Henning TD, Alba LM, Rubio S. A meningococcal endocarditis in a patient with Sweet's syndrome. *Int J Cardiol* 2007; 117: e51–2.
- 3 Natarajan A, Hindocha D, Kular N, Fergey S, Davies JR. Lesson of the month (1). Vasculitic rash: do not jump to conclusions. *Clin Med* 2012; 2: 179–80.
- 4 Nery PB, Fernandes R, Nair GM et al. Device-related infection among patients with pacemakers and implantable defibrillators: incidence, risk factors and consequences. *J Cardiovasc Electrophysiol* 2010; 21: 786–90. <http://dx.doi.org/10.1111/j.1540-8167.2009.01690.x>
- 5 Baddour LM, Bettmann MA, Bolger AF et al. Nonvalvular cardiovascular device-related infections. *Circulation* 2003; 108: 2015–31.
- 6 Takahashi N, Shimada T, Ishibashi Y et al. The pitfall of coagulase-negative staphylococci: a case of *Staphylococcus lugdunensis* endocarditis. *Int J Cardiol* 2009; 137: e15–7. <http://dx.doi.org/10.1016/j.ijcard.2008.05.041>
- 7 Sohail MR, Uslan DZ, Khan AH et al. Management and outcome of permanent pacemaker and implantable cardioverter-defibrillator infections. *J Am Coll Cardiol* 2007; 49: 1851–9.
- 8 Cacoub P, Leprince P, Nataf P et al. Pacemaker infective endocarditis. *Am J Cardiol* 1998; 82: 480–4.
- 9 Habib G, Hoen B, Tornos P et al. Guidelines on the prevention, diagnosis, and treatment of infective endocarditis. *Eur Heart J* 2009; 30: 2369–2413. <http://dx.doi.org/10.1093/eurheartj/ehp285>
- 10 Baddour LM, Epstein AE, Erickson CC et al. Update on cardiovascular implantable electronic device infections and their management: a scientific statement from the American Heart Association. *Circulation* 2010; 121: 458–77. <http://dx.doi.org/10.1161/CIRCULATIONAHA.109.192665>