Gram-positive occult bacteremia in patients with pacemaker and mechanical valve prosthesis: a difficult therapeutic challenge

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Aims
In pacemaker patients with Gram-positive occult bacteremia, it is reasonable to remove the whole stimulation system, but therapeutic decision is sometimes very challenging.

Methods and results
A young patient at 6 years of age underwent dual-chamber pacemaker implantation due to complete atrioventricular block after mitral valve replacement. He felt well until November 2008, when he suffered from febrile illness with blood cultures disclosing methicillin-resistant staphylococcus aureus strain. Repeated antibiotic courses were effective only in obtaining temporary remissions. Consecutive transoesophageal echocardiography examinations were inconclusive. A labelled leucocyte scintigraphy, showing increased captation along leads, was very helpful and critical in guiding our decision to extract leads.

Conclusion
In equivocal cases, or when the hazard of extraction procedure is presumably high, every accessory diagnostic tool (like scintigraphy with labelled leucocytes) is helpful in establishing a definitive diagnosis and in strengthening a somewhat difficult decision.

Keywords
Pacemaker • Lead extraction • Infection • Diagnosis • Occult bacteremia • Leucocyte scintigraphy

Introduction
Recent Expert Consensus states that lead extraction is the necessary option in cases of persistent Gram-positive occult bacteremia in patients with a pacemaker; however, in the clinical setting, the decision to extract leads may be very difficult.

Observed case
A 9-year old patient, who underwent pacemaker implantation 5 years earlier, was referred to our cardiology department because of fever and bloodstream bacterial infection. When the child was only 2 months old, he underwent surgical correction of an interatrial defect and implantation of an epicardial pacemaker for transient post-surgical atrioventricular block. At 4 years of age, he also underwent mitral valve substitution with a mechanical prosthesis and removal of the epicardial lead. This procedure was complicated by permanent complete atrioventricular block and led to the need for dual-chamber pacemaker implantation. The patient did well in the following years, but from November 2008 onwards, he suffered recurrent septic febrile illness, with cultures repeatedly growing a methicillin-resistant staphylococcus aureus.

Repeated courses of antibiotics were effective in obtaining only temporary remissions, with invariable relapses of fever, leucocytosis, increase of C-reactive protein and positive blood cultures soon after discontinuation of therapy. Consecutive transoesophageal echocardiography (TEE) examinations never showed lead or valvular vegetations, and the prosthesis appeared normal (Figure 1). Finally, to clearly ascertain whether lead infection was responsible for the patient’s illness, and to justify percutaneous lead extraction without...
cardiac surgery reintervention, we performed a labelled leucocyte scintigraphy (99mTc-HMPAO-leucocytes: leucocytes labelled with 99mTc, the linker being hexamethylpropylene-amine-oxime, HMPAO) (Figure 2). This examination showed increased captation along the leads and due to the seriousness of the systemic infection, we were compelled to perform lead extraction.

Methods

The procedure was performed under general anaesthesia. Manual traction with conventional stylets was ineffective, and therefore, we used dilation with polypropylene sheaths from Cook Vascular Inc. (Leechburg, PA, USA). In particular, we used the single-sheath technique, according to Bongiorni’s method.2

Results

The atrial lead was easily removed with mild traction, while polypropylene sheaths of 8.5 and 10 F were necessary to free the ventricular lead from adherences along the innominate vein, at the innominate–superior vena cava angle, at the superior vena cava–right atrium junction, and at the ventricular apex. Due to these adherences, when using the sheaths, the ventricular lead was broken and the distal tip remained anchored to the endocardial wall. As soon as the leads were removed, a transthoracic echocardiography (TTE) showed an echogenic, tubular mass attached to the superior vena cava, with an offshoot floating into the right atrium (Figure 3). The inspection of the right ventricular lead revealed that its distal segment was covered by fibrous tissue. We hypothesized that the floating mass in the right atrium could be the residual fibrous layer torn off from the lead anchored to the superior vena cava by adherences. Tip and connector of the atrial lead and connector of the ventricular lead, following extraction, were held in reserve in sterile containers in a 4°C controlled temperature fridge and consequently sent to the Microbiology Department for cultural and antibiogram examination.

Subsequent course

The post-operative observation in the intensive care unit was uneventful, except for frequent acute sustained ventricular tachycardia runs. After confirmation over at least 72 h of subsequent persistent negative blood cultures, a new stimulation system was reimplanted through a limited right thoracotomy access, consisting of an epicardial right ventricular lead connected to a pulse generator located in a subcutaneous right subcostal pocket. The epicardial stimulation system was preferred because of the uncertainty about the aetiology and significance of the intracardiac masses observed after extraction (i.e. uncertainty about complete recovery from the infectious process immediately after the extraction procedure). The specimen of the leads, sectioned following lead extraction, grew a penicillin-resistant Staphylococcus epidermidis.
Subsequent serial TTE confirmed the presence of a floating mass in the right atrium originating from the superior vena cava. Oral anticoagulant therapy was restarted and antibiotic therapy was continued after discharge and maintained for 6 weeks. After 1 month, the TEE was repeated showing that the floating mass, although decreased in size, was still present and attached to the superior vena cava. The patient remained asymptomatic, without fever, with negative blood cultures and normalization of inflammatory laboratory results for the following 12 months.

Discussion: technical issues

Pacemakers and ICD devices are increasingly used in today’s clinical practice, including paediatric patients. Extraction of pacemaker leads represents the optimal therapy in patients with endocarditis involving pacemaker leads that do not respond to antibiotic treatment. The percutaneous approach is becoming a commonly used and safer method; however, complications related to percutaneous extraction are not rare and are often serious.

This case report describes the incomplete removal of one of the leads, with residual tissue floating in the right atrium after pacemaker extraction. The intracardiac masses showed by after-procedure TEE might be confused with residuals of infective vegetations, but the experience in our population, as with single cases reported by others, demonstrates that these intracardiac masses are sometimes part of adherences between the lead and endocardium disrupted by the dilation process. As shown in Figure 2, the labelled leucocyte scintigraphy demonstrated increased captation along the ventricular lead, including the tip. The distal tip, that remained anchored to the endocardial wall, is, however, a metal portion of the lead, on which bacteria normally do not manage to grow. These hypotheses are further sustained by the subsequent benign course, with complete recovery.

This case shows that the stimulation device should always be suspected in patients with pacemakers and systemic infectious illness. Recent Expert Consensus from the Heart Rhythm Society recognizes Gram-positive occult bacteremia as a Class I, Level of Evidence B indication for lead extraction. Therefore, in cases of Gram-positive occult bacteremia, it is reasonable to remove the whole stimulation system, but the therapeutic decision was very challenging in the case presented here. Lead extraction was considered to be very hazardous in this child, due to his young age, the previously experienced difficulty of extracting leads in children because of stronger fibrous adherences (unpublished results), the long time from implantation, and the concomitant presence of other prosthetic material, the mitral mechanical prosthesis, which could be on its own responsible for maintaining the infectious process. A labelled leucocyte scintigraphy, showing increased captation along the leads, was very helpful in guiding our difficult decision to extract the leads.

Nuclear medicine imaging techniques can help in patient evaluation where infection is suspected. When selected and tailored to the clinical situation, most techniques provide information with high sensitivity. These techniques, such as scintigraphy with autologous In111, or 99mTc-labelled leucocytes, 99mTc-HMPAO-leucocytes, or 18F-deoxyglucose positron emission tomography were sometimes used in pacemaker patients to detect infection. While the key role of echocardiography in detecting lead vegetations is unquestioned, nuclear diagnostic techniques may play an important ancillary role in situations in which—as in the case described—all other available techniques are inconclusive, to strengthen the difficult decision of extracting leads.

Conclusions

In patients with pacemakers and recurrent systemic infection, the pacemaker must always be ruled out as the causative agent. Even if recent Expert Consensus recognizes the extraction of leads as a necessary procedure in cases of Gram-positive occult bacteremia in pacemaker patients, in equivocal cases, or when the hazard of extraction procedure is considered to be high, accessory diagnostic tools such as scintigraphy with labelled leucocytes are helpful in establishing a definitive diagnosis and in strengthening a somewhat difficult decision. Moreover, this reported case further demonstrates that the extraction of the entire stimulation system is the only procedure to allow complete recovery.
Conflicts of interest: none declared.

References


