

Endocarditis caused by *Pseudomonas spp*: description of a rare case

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Acronyms

IE: infectious endocarditis

ABSTRACT

Infections due to cardiovascular devices are becoming more frequent. Here is presented the case of a 62-year-old male patient with fever and poor general condition, who had been intervened seven years ago for the implantation of a pacemaker. In the blood tests, leukocytosis and hemoglobin below 10 g/L were observed. The echocardiogram showed a pacemaker electrode in the right cavities with multiple echo-dense masses indicating infectious endocarditis. A surgical extraction of the device was performed as well as culture of vegetation samples with the isolation of *Pseudomonas spp*. An antimicrobial therapy was provided on the basis of the antibiogram, and the patient progressed satisfactorily. This clinical entity should be considered in any patient with a pacemaker who presents fever and general symptoms, once other possible sources of infection are ruled out; in addition to acting quickly in order to achieve an adequate treatment.

Keywords: Artificial pacemaker, Infective endocarditis, *Pseudomonas spp*

Endocarditis por Pseudomonas spp: Descripción de un caso poco frecuente

RESUMEN

Las infecciones por los dispositivos cardiovasculares son cada vez más frecuentes. Se presenta el caso de un hombre de 62 años edad con fiebre y toma del estado general, que había sido intervenido hacía siete años para la implantación de un marcapasos. En los complementarios se observaron leucocitosis y hemoglobina por debajo de 10 g/L; y en el ecocardiograma, un electrodo de marcapaso en cavidades derechas con múltiples masas ecodensas que indicaban endocarditis infecciosa. Se realizó extracción quirúrgica del dispositivo y cultivo de muestras de las vegetaciones, con aislamiento de *Pseudomonas spp*. Se administró terapia antimicrobiana sobre la base del antibiograma y el paciente evolucionó satisfactoriamente. Se debe pensar en esta enfermedad ante todo paciente con marcapasos que presente fiebre y sintomatología general, una vez que se han descartado otros posibles focos de infección; además, se debe actuar rápido para lograr un tratamiento adecuado.

Palabras clave: Marcapaso artificial, Endocarditis infecciosa, *Pseudomonas spp*

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INTRODUCTION

Currently, there is a greater use of implantable cardiac devices, and as a result, pathogenic microorganisms are increasingly important in the asso-

ciated infectious complications, whose diagnosis is a challenge for medical teams and requires a thorough microbiological and imaging search, as well as meticulous judgment to define appropriate treatment plans and follow-up¹.

There are important advances in the postoperative care of these patients, who are generally in serious condition. Moreover, there are advanced echocardiographic techniques that allow to accurately diagnose injuries of cardiac structures in preoperative, as well as the intra and postoperative monitoring of the performed surgeries. All this results in a longer survival².

The European Society of Cardiology, from its 2009 guidelines to the last update of 2015³, defines infectious endocarditis (IE) as a peculiar disease, for three reasons. In the first place, its incidence and mortality have not changed in the last 30 years, despite indisputable advances in diagnosis and treatment. Second, it is one highly heterogeneous entity, which may manifest clinically in many ways, depending on the patient's underlying disease, the causative organism and the presence of local complications and at distance, thus, its treatment requires the constitution of multidisciplinary working groups. Finally, the guidelines are often based on expert opinions, due to the absence of randomized studies.

Infections on cardiac devices have high mortality and they are classified into four categories: 1) early post-implant inflammation, 2) uncomplicated infection of the generator pocket, 3) complicated infection the pocket itself, and 4) right IE^{4,5}.

Taking into account that, at the Instituto de Cardiología y Cirugía Cardiovascular pacemaker implants are often performed, it is necessary to study patients suffering from IE associated with these devices, which is why we are motivated to present the following case.

CASE REPORT

A 61-year-old man, mixed race, personal medical history of high blood pressure, atrial fibrillation, chronic ischemic heart disease since 2008, when he presented a non-reperfused myocardial infarction, but without hemodynamic repercussions. In 2010, he presented a cardiorespiratory arrest due to ventricular arrhythmias and a complete atrioventricular block, i.e. a pacemaker in VVI mode was implanted, with apparently favorable recovery; besides his oth-

er usual treatment with methyldopa (500 mg c/8h), aspirin (125 mg/day) and nitropental (30 mg/day).

On this occasion, when he arrived at the hospital, he referred that he had had fine tremors and fever of 38°C for the last 11 months, which improved with the administration of antipyretics, but eventually came back more frequent and of greater intensity.

Physical examination

Skin and mucous membranes: moist and slightly hypopigmented.

Respiratory apparatus: no dyspnea, no retraction, respiratory rate of 22 per minute, normal vesicular murmur, no rales.

Cardiovascular apparatus: beat of the non-visible tip, but palpable at level of sixth intercostal space, mid-clavicular line; rhythmic cardiac noise, heart rate of 92 beats per minute, blood pressure 120/80 mmHg and systolic murmurs II/VI in pulmonary area, radiating to the armpit, and the tricuspid focus without fremitus.

Subcutaneous cellular tissue: non-infiltrated.

Complementary blood tests

Hemoglobin concentration 9.2 g/L; hematocrit 30%; leukocytes $15 \times 10^9/L$ (lymphocytes 13%, monocytes 6%, granulocytes 80.5%); platelets $200 \times 10^9/L$; sodium 134 meq/L; potassium 4.7 meq/L; chlorine 101 meq/L; calcium 1.102 mmol/L. Normal hemochemistry.

Echocardiogram

In the transthoracic echocardiography, a good global contractility and segmental left ventricular were observed at rest, tricuspid transvalvular gradient of 28 mmHg and TAPSE (Tricuspid Annular Plane Systolic Excursion) of 18 mm, without pulmonary hypertension. It was also found the pacemaker's electrode in right cavities with multiple echodense masses (**Figure 1**), with suspected large vegetations, images that were corroborated in the transeophageal echocardiography.

A surgery with extracorporeal circulation was performed (52 minutes of bypass and 26 anoxic arrest), whereby, the electrode with vegetation was extracted (**Figure 2**), from which were isolated – through cultivation – the *Pseudomonas* spp., sensitive to several antimicrobial usual for this germen; therefore, the treatment that had been started at the time of diagnosis was continued: gentamicin, vancomycin and rifampicin, at the recommended doses. The patient had a satisfactory evolution and negative

results were obtained from the blood cultures after completion of treatment.

COMMENT

In the endocarditis on electrodes belonging to pacemakers and implantable defibrillators, three mechanisms that can develop infection have been described⁵:

1. Pocket sepsis: this infection is secondary to the spread of germs from the pocket along the electrode. This is the mechanism responsible for cases of sepsis that may occur in the first weeks or months after the intervention, and subsequently the entire system is isolated by granulation tissue that hinders the progress of microorganisms.
2. Metastatic colonization of the electrode: in the course of a bacteremia by germs from an infectious focus at a distance, or located in the generator's pocket.
3. Unknown: in up to 30% of cases it is not possible to find the entrance door.

Just as the first mechanism is responsible for early infections of the devices, the last two are the cause of delayed IE, favored by small fractures of the probe's insulation at the traction or suture sites. The germs adhere to the plastic surface of the electrode, from where they invade the deeper layers, create an amorphous mass that isolates the plastic matrix of the probe, and render the host's defenses and the antibiotic treatment in the fight against infection, therefore, it turns out it would be necessary to remove the electrode⁶.

This specific case suggests that this is a metastatic endocarditis, as it appeared seven years after the implantation of the pacemaker. Its characteristics match those of the 30 individuals studied by Cruz *et al*⁷, who encountered a male (66%) predominance and the group of 60 years and over (56.7%). All of

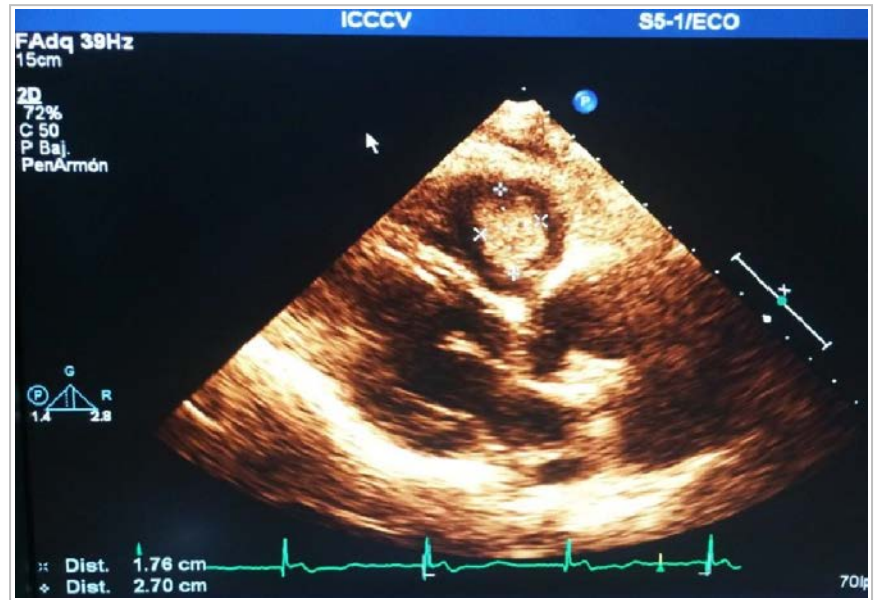


Figure 1. Pacemaker's electrode in right cavities with echodense mass. Parasternal long axis view.



Figure 2. Macroscopic appearance of the vegetation present in the pacemaker removed.

them, 100%, presented fever, general symptoms and arthralgias; and 70%, respiratory symptoms. A 53.3% were admitted with a time of evolution of symptoms less than three months. There was a history of changes in the generator (53.3%), the system (46.7%) and pocket sepsis (30%). In 70%, the *staphylococcus sp.* was isolated. The vegetations attached to the electrode (96.7%), greater than or equal to 1 cm (80%), and multiple (63.3%), were the most common

echocardiographic findings.

Among the complementary blood tests performed in the case presented, leukocytosis and hemoglobin below 10 g/L were observed, which reflects the severity of the systemic infection. If we add to this the significant delay for the diagnosis and – consequently – for treatment, it justifies the gloomy prognosis that the IE still has of the electrodes of cardiac devices.

In the experience of Rosso *et al*⁸, about 77% of patients had pocket affection, 54% of them had evidence of bacteremia, and 36% (8 of 22) had evident lesions in the echocardiography, suggestive of vegetations at the level of the device's electrodes.

The patient of this particular case did not undergo presurgical blood culture, however, his clinical and echocardiographic characteristics suggested a high probability of bacteremia, therefore, the surgery was immediately decided, thereby growing the extracted surgical specimen, which showed the presence of *pseudomonas* spp., a germ that belongs to the glucose non-fermenting gram-negative bacilli, a reason where the importance of this case lies, the rarity of its association with the IE associated to pacemakers.

The most frequent causative agents are *staphylococcus aureus*, which predominates in early infections, and coagulase-negative staphylococci (*staphylococcus epidermidis*) that predominate in late infections. The infection by *propionibacterium acnes* is not uncommon and it causes chronic infections and long evolution course^{9,10}.

Currently, *pseudomonas* (*sensu stricto*) includes a large number of species that are classified in two categories (**Box**)¹¹. Among all the species, the *p. aeruginosa* is the most clinically relevant. Infections by this germ have remained constant, in terms of incidence and affected tissues, over the last few years. However, the increase in strains resistant to multiple antibiotics may anticipate that infections with this microorganism will continue to be a leading cause of morbidity and mortality in the coming years¹². As previously mentioned, it was not possible to specify the species that was affecting the patient, however, it is a case that demonstrates the need for epidemiological surveillance in patients who are implanted a cardiac pacing device.

El tratamiento en las infecciones sobre dispositivos cardíacos se basa en la antibioterapia prolongada junto con la extracción del sistema. El método quirúrgico de elección, según la literatura revisada, es la extracción de los cables mediante cirugía

Box. Categories of the *pseudomonas* species.

Group of fluorescent species
- <i>P. aeruginosa</i>
- <i>P. fluorescens</i>
- <i>P. monteilii</i>
- <i>P. putida</i>
- <i>P. veronii</i>
Group of non-fluorescent species
- <i>P. alcaligenes</i>
- <i>P. luteola</i>
- <i>P. mendocina</i>
- <i>P. oryzihabitans</i>
- <i>P. pseudoalcaligenes</i>
- <i>P. stutzeri</i> . One of its genomic variants has been defined as <i>P. balearia</i> .

abierta con circulación extracorpórea, que permite realizar una extracción completa bajo visión directa y tiene menor riesgo de dañar estructuras cardíacas y provocar la diseminación de las vegetaciones con posibilidad de embolismos, además de poder realizar otros procedimientos asociados, si fuera necesario^{1-3,7,8}. Fajardo *et al*² aplicaron la extracción de marcapasos con circulación extracorpórea en el 46,7% de las cirugías realizadas y obtuvieron resultados favorables, con el mínimo de complicaciones y una alta supervivencia.

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