

Pacemaker-Related Endocarditis: Clinical Features and Treatment

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Background and aim of the study: Removal of the entire infected system is the traditionally indicated management of pacemaker lead endocarditis (PLE), based on expert recommendations. Herein is described the present authors' experience with this condition.

Methods: Between 1987 and 2004, all consecutive patients with PLE treated at a tertiary referral university hospital and a community hospital were prospectively selected. Clinical features, management and outcome were analyzed.

Results: Thirteen cases of PLE were diagnosed. Surgery was performed in 10 cases, and medical treatment alone in three (due to advanced age in two cases and because of terminal colon cancer in one case). Four subjects died before discharge: three

deaths occurred after surgery (one patient died due to refractory ventricular arrhythmia and two from persistent sepsis), and one unoperated patient died from sepsis and severe renal failure. No deaths or late surgeries were observed after a mean follow up period of 37 ± 14 months. Both patients who survived hospitalization and underwent only medical treatment were free from late complications after 30 and 60 months follow up, respectively.

Conclusion: Some patients with PLE present a good evolution without surgery, suggesting that surgical treatment is not mandatory in this situation. However, an indication for surgery may be similar to that for other cases of infective endocarditis.

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Pacemaker lead endocarditis (PLE) is a rare, but potentially fatal, complication in patients fitted with these devices. The incidence of the condition has been estimated as 550-580 cases per million pacemakers per patient-year (1-4), with the incidence seeming to rise during the later decades of life (2). Traditionally, the indicated treatment for this condition has been removal of the entire infected system (3). Although this approach is based on expert recommendation, several published reports have provoked controversy with regard to the absolute necessity for surgery in this situation. In this respect, some reports were clearly in favor of surgery (4-7), while others noted good results in patients managed only with medical treatment (8,9). The aim of the present study was to describe the clinical features, management and prognosis of PLE within the environment of the authors' institutions.

Clinical material and methods

Patients and inclusion criteria

A prospective study was conducted involving all consecutive cases of infective endocarditis among non-intravenous drug users aged ≥ 14 years who were diagnosed at two centers (one tertiary university hospital and one community hospital) between January 1987 and October 2004. All patients included in the present analysis fulfilled the criteria of definite infective endocarditis. The diagnosis was made according to criteria proposed by Von Reyn et al. (10) until 1994, and thereafter to criteria proposed by Durack et al. (11). When retrospectively applying criteria proposed by the European Society of Cardiology Guidelines (3), none of the patients was rejected. For this study, all patients selected presented with PLE. The study protocol received normal ethical approval for observational studies conducted at the authors' institution, and all patients provided their informed consent.

Management protocol

All patients received antibiotic treatment according to antimicrobial susceptibility. Although a policy of removal of the infected system was applied to all

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patients, the presence of high-risk surgical factors in three patients determined that this small group received only medical treatment. In this way it was possible to observe the evolution of both the surgical and medical groups, albeit in a reduced number of patients.

Statistical analysis

Continuous variables were expressed as mean \pm SD, and categorical variables as percentages. Comparisons between two categories were made using chi-square or Fisher's exact test for proportional variables. A p-value <0.05 was considered to be statistically significant.

Results

Clinical features

During the study period, a total of 254 patients with infective endocarditis was diagnosed, of whom 13 (11 males, two females; mean age 61 ± 14 years; range: 35 to 84 years) presented with PLE. The clinical data of the latter patients are summarized in Table I. Only in two cases did the disease appear during the immediate post-implant period. The probable source of infection was digestive in one case (colon cancer), peripheral accesses in two cases (venous lines with local signs suggesting infection), the implantation procedure (the two cases in the immediate post-implant did not have any other predisposing circumstances) in two cases, and non-identified in eight cases. The most frequently infecting microorganisms were *Staphylococcus* spp. Vegetations were observed in most patients. The only

two patients without evidence of vegetations as seen by either transthoracic or transesophageal echocardiography underwent surgery; subsequent evidence of endocarditis was provided histologically. All cases underwent transthoracic echocardiography, with transesophageal studies also being performed since 1991.

Complications and management

The observed complications were persistent sepsis (fever and bacteremia after one week of adequate antimicrobial therapy) in eight cases, acute renal failure (creatinine clearance <20 ml/min) in two cases, septic embolism in one case, and right heart failure (with need for intravenous diuretic treatment) in one case. The duration of antibiotic treatment was six weeks in all cases. Surgery was performed in 10 patients during the hospital stay, due to persistent sepsis in seven cases and to acute glomerulonephritis in one case. Two other cases were operated on only because of presenting endocarditis on the pacemaker leads.

Three patients received only medical treatment; two were treated because of advanced age and comorbidities (one patient, aged 84 years, had diabetes and a prior transient ischemic attack; a second patient, aged 81 years, had diabetes and moderate renal failure), and another patient (aged 80 years) was diagnosed with terminal colon cancer (in this patient *Enterococcus faecium* was the causative microorganism of PLE). Two patients of the medical treatment group presented a favorable initial course with rapid abolition of fever, without complications.

Table I: Clinical features of patients with pacemaker lead endocarditis.

Parameter	Medical cases (n = 3)	Surgical cases (n = 10)	All cases (n = 13)
Age (years)*	81 \pm 2	57 \pm 11	61 \pm 14
Male gender	2 (66)	9 (90)	11 (85)
Time since pacemaker implantation (months)*	40 \pm 11	50 \pm 36	47 \pm 38
Duration of symptoms (days)*	17 \pm 7	18 \pm 8	18 \pm 7
Causative microorganism			
Staphylococcus aureus	2 (66)	4 (40)	6 (46)
Staphylococcus epidermidis	0	5 (50)	5 (38)
Enterococcus faecium	1 (33)	0	1 (8)
Not identified	0	1 (10)	1 (8)
Vegetations on TTE	3/3 (100)	8/10 (80)	11/13 (85)
Vegetations on TEE	3/3 (100)	7/8 (88)	10/11 (91)
Vegetations size (mm)*	14 \pm 7	15 \pm 8	15 \pm 8
In-hospital mortality	1 (33)	3 (30)	4 (31)
Late mortality	0	0	0

*Values are mean \pm SD.

Values in parentheses are percentages.

TEE: Transesophageal echocardiography; TTE: Transthoracic echocardiography.

Early and late survival

Four patients (31%) died before discharge. Three died after surgery (one patient died due to refractory ventricular arrhythmia and another two due to persistent sepsis), and one unoperated patient (aged 81 years) died due to sepsis and severe renal failure. No deaths or late surgeries were observed after a mean of 37 ± 14 months. The two patients who underwent only medical treatment and survived the acute phase of the disease were free from late complications at 30 and 60 months follow up, respectively.

Discussion

The present study represented a significant group of patients with PLE, given the rarity of this complication. The mean age of the present patients (61 years) was similar to that reported elsewhere (4,6,7), although some of these other series described patients of more advanced age (5,8). The most frequently responsible microorganism was *Staphylococcus* spp., and this was in accordance with previous reports (4-8). The first published series (6,7) to indicate surgical treatment for all patients described mortality rates of 24 and 27%, respectively. Erdinler et al. (8) reported a mean three-year event-free survival in three medically managed patients, but a mortality of 25% in those patients who underwent surgery. There have also been isolated case reports of prolonged survival without surgery in PLE (9). Another interesting study (4) reported 12.5% mortality among 24 patients with PLE that was treated surgically, and one death and six episodes of recurrent endocarditis in the seven patients managed initially only with antibiotics. These authors concluded that the preferred treatment should be surgical in all cases. The present study adds another three medically managed cases, with early survival similar to that of patients treated surgically, and without complications during the mid-term follow up. The probability of misdiagnosis (false-positive endocarditis) in these patients was minimal, as unequivocal evidence of endocardial involvement was demonstrated in all cases, both by transthoracic and transesophageal echocardiography.

Study limitations

All published series of PLE, including the present study, have suffered the limitation of scarce numbers of patients. Nevertheless, it can be suggested that, although most patients with PLE will most likely require surgical treatment, those who constitute a high surgical risk due to advanced age and significant comorbidities can be treated initially with antibiotics. If the response is prompt, the medical therapy can be continued; however, if the response is poor, then surgery should be considered.

In conclusion, PLE was observed mainly in patients aged ≥ 60 years, with the most frequent causative microorganism being *Staphylococcus* spp. Some patients presented good mid-term results without surgery, suggesting that in some cases with high surgical risk the initial approach to management might be medical.

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