



# Prosthetic valve endocarditis and Infective endocarditis affecting cardiac implantable electronic devices

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## Abstract

## Introduction:

Prosthetic valve endocarditis (PVE) and cardiac device-related infective endocarditis (CDRIE) are the most severe forms of infective endocarditis (IE), they are burdened with a heavy morbidity-mortality.

## Method:

We present a retrospective study of a series of 35 cases of PVE and CDRIE collected in the cardiology department B at CHU IBN SINA, between January 2015 and December 2019.

## Objectives:

Analyse, on the one hand, the epidemiological, clinical, bacteriological and anatomical characteristics of the PVE and CDRIE, and, on the other hand, the risk factors, and the therapeutic and prophylactic modalities of these forms of endocarditis.

## Results:

The epidemiological profile of our patients was dominated by male sex with an average age of 52.8 years. Of the 35 patients, 10 had early infective endocarditis (IE) and 25 had late IE. Clinical signs were dominated by fever in 71% of patients and local signs in 76% of patients with CDRIE. All of our patients received blood cultures on the first day of admission. HC was negative in 10 patients (28%), for the other 25 (72%) we noted a slight predominance of staphylococci followed by streptococci and BGN. Echocardiography especially transesophageal was of a fundamental contribution to the diagnosis by allowing objectifying for the PVE: vegetations (10 cases, 45%), paravalvular abscesses (3 cases, 13%), dehiscence of the prosthetic valve (3 cases, 13%), and prosthetic leaks (8 cases, 36%). For CDRIE: Probe thickening in 9 patients (69%) and vegetations in 10 cases (76%). Treatment in 81% of patients with antibiotics was medical with a duration of antibiotic therapy of at least 6 weeks and medico-surgical in 18% of patients. Concerning the CDRIE treatment was based on all patients on the extraction of the infected equipment plus antibiotic therapy. 4 patients had died; they were all patients with PVE. No deaths or complications were reported in patients with CDRIE.

## Conclusion:

Through this work we insist on the need to shorten the time of diagnosis by educating patients to avoid the empirical consumption of antibiotics, the systematic realization of echocardiography especially transoesophageal and blood cultures. Due to the reserved prognosis, surgery, when indicated, should not be delayed and antibiotic prophylaxis should never be neglected.

## I-Introduction:

The PVE and CDRIE are the most severe forms of infectious endocarditis, they are burdened with a heavy morbidity-mortality.

## II- Material and method:

This is a retrospective study of PVE and CDRIE in 35 patients (22 PVE and 13 CDRIE), collected in the Cardiology B unit, hospitalized between January 2015 and December 2019.

All patients are classified according to the elapsed time between valve replacements.

## III-Result:

### 1- Patient Characteristics:

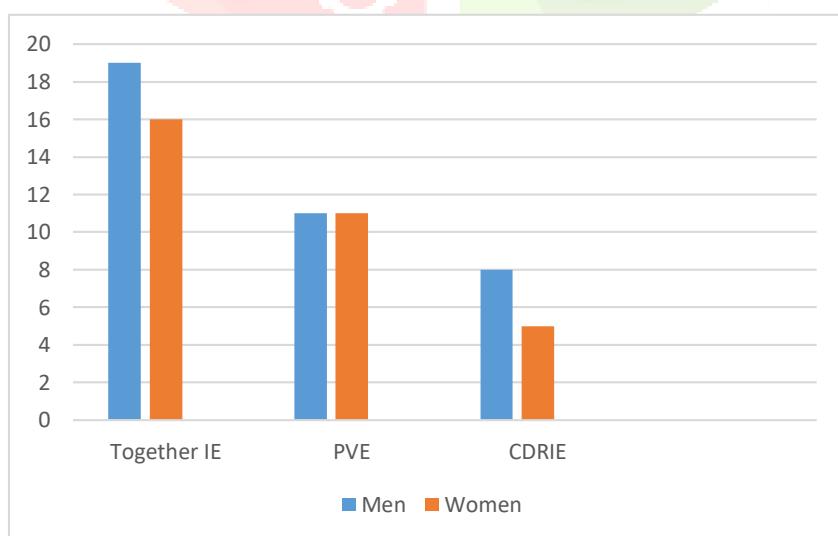
#### 1.1- Age:

The age range ranges from:

- 19 to 83 years with an average of 52.8 years for all patients
- 19 to 72 years with an average of 46.15 years for the PVE
- 29 to 72 years with an average of 59.6 years for CDRIE

#### 1.2- Sex:

Of our 35 patients, 19 are men (54.2%) and 16 are women (47.7%). PVE was diagnosed in our service in 11 men and 11 women, and CIED was diagnosed in 8 men and 5 women.



**Figure 1: Distribution of patients by sex**

## 2- Clinical Data:

- **PVE:**

- Febrile syndrome was present in 17 patients (77%), with varying degrees of myalgia, arthralgia, and AEG. Other manifestations associated with fever are noted as dyspnea in 5 patients (22%), palpitations in 4 patients (18%), urination burning in 2 cases (9%), sinusitis in 1 patient (4%), and severe sepsis in 1 patient (4%).

- Physical examination noted a heart murmur in 6 patients (27%), splenomegaly in 1 case and skin signs (Meynet nodules), and marginal erythema in 1 patient (4%).

- Signs of heart failure were present in 4 (18%) patients.

- **CDRIE:**

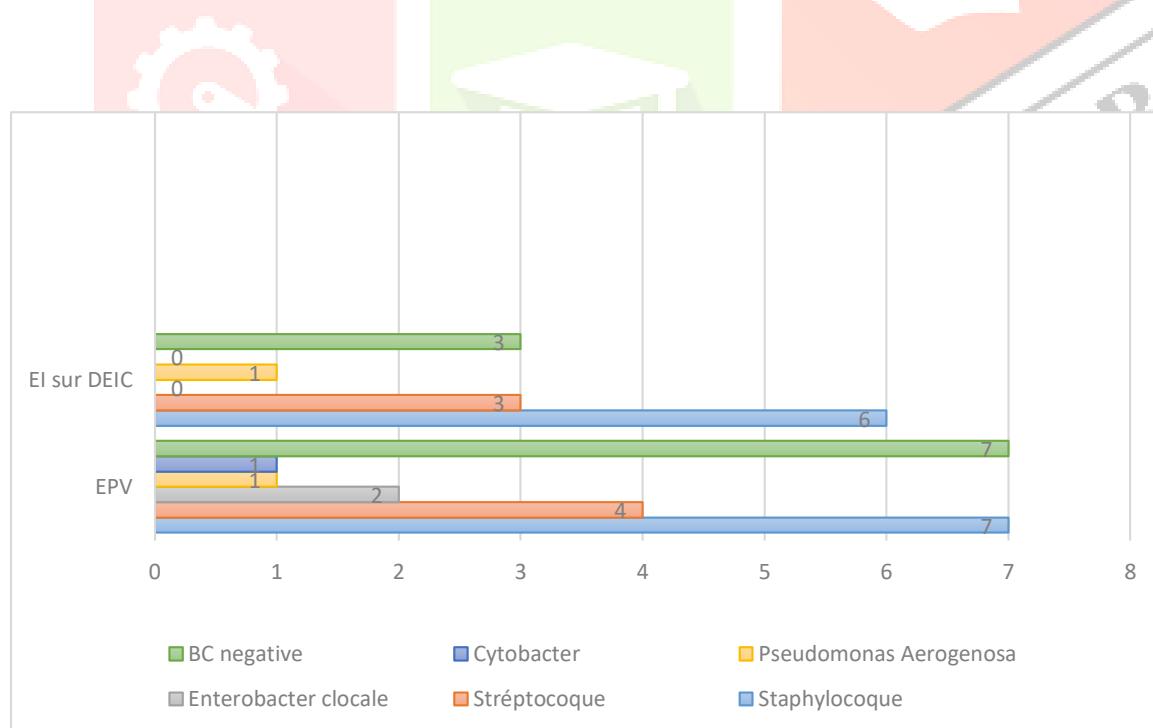
- Fever in 8 patients (61%).

- Local signs (such as swelling, redness, purulent discharge, or exteriorisation) were present in 10 patients (76%). These signs were associated with fever in five patients and apyretic in five other patients.

- Dry cough with asthenia in one patient.

## 3 -Biology Data:

**Blood culture results:** All our patients received blood cultures from the first day of admission, blood cultures (BC) were negative in 10 patients (28%), and isolated in the other 25 patients a germ: (71%) staphylococcus (13 cases, 37%), streptococcus (7 cases, 2%), Pseudomonas (2 cases, 5%), Enterobacter cloacal (2 cases, 5%) and Citrobacter (1 case, 2%).



**Figure 2: blood culture results.**

#### 4-Echocardiography Data:

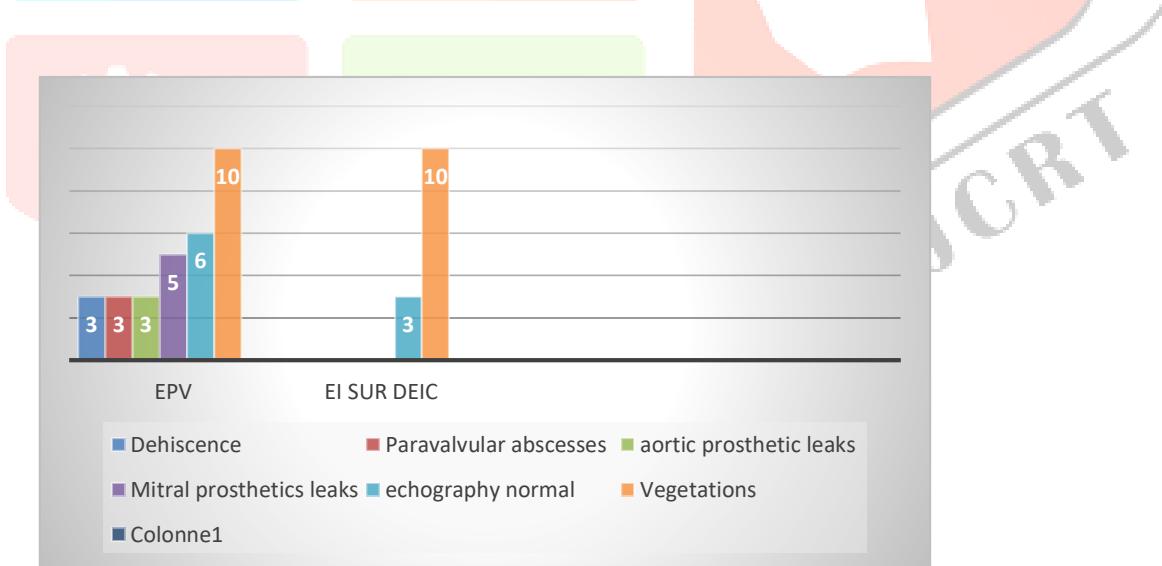
Transthoracic and transesophageal echocardiography have been performed in all our patients.

- **PVE** : Echocardiography made it possible to objectively:
- **Vegetations (10 cases, 45%)**; of different size, the smallest is 3 mm and the largest was 17 mm on an aortic prosthesis,
- **Paravalvular abscesses (3 cases, 13%)**; A periaortic abscess reaching the fistulized sino-tubular junction in the aorta and left atrium. Two more periaortic abscesses circling the wall externally. The 3 abscesses are in patients with endocarditis on the aortic prosthesis
- **Dehiscence of the prosthetic valve. (3 cases, 13%)**; A significant disintegration of a disk mitral prosthesis causing massive MI. Two partial insertions of double fin prostheses one mitral, and the other aortic
- **Aortic prosthetic leaks (3 cases, 13%)**; Two severe leaks, one moderate leak.
- **Leaks from mitral prosthetics (5 cases, 13%)**; Three major leaks, one moderate leak and one minor leak.

Echocardiography was normal in 6 patients

- **CDRIE**

Echocardiography showed the vegetations in 10 cases or 76% (for 5 cases the vegetation was visualized only on the TEE) with vegetation on the insertion of the tricuspid valve and vegetation on the right atrium. That's 76% of the cases.



**Figure 3: Echocardiography Data**

**5-Complications:** The complications that punctuated the evolution of the initial phase including the period of medical treatment are:

Systemic embolism (1 case), heart failure (6 cases), and shock (4 cases): 2 cases of septic shock and 2 cases of cardiogenic shock.

We reported 4 deaths (the 4 deaths were PEFP patients), a mortality rate of 18% for PEV, and 0% for AE on DEIC.

The causes of death were septic shock (2cas), cardiogenic PAO (2cas).

## 6-Treatment:

- PVE

### a-Medical treatment

#### a-1 - Antibiotic therapy

Our probabilistic choice of antibiotics (ATB) was guided by the time of onset of AR prior to blood culture results. The ATB treatment was renewed or rectified according to the antibiogram data. The initial treatment regimen involved:

For early forms with a microbiological profile characterized by the frequency of staphylococcus infections:

**Vancomycin 30mg/kg/d not to exceed 2g/d for 6 weeks + Gentamicin 3-5mg/kg/d for 2 weeks.**

For late forms with a microbiological profile similar to that of AEs on native valves:

**Ampicillin 200mg/kg/d for 6 weeks. + Gentamicin 3-5mg/kg/d for 2 weeks.**

**a-2 - Anticoagulants:** For mechanical prostheses, AVK has been replaced by heparinotherapy: HBPM curative dose; Enoxaparin 1 mg/kg twice daily.

**b-Surgical treatment: (reintervention)** Of the 22 patients, 4 were re-operated at a more or less early stage of PEFP. The reasons for the intervention were a hemodynamic failure in 2 patients, an uncontrolled infectious process in 1 patient, and both reasons in 1 patient.

- CDRIE

The treatment of infective endocarditis on pacemaker or defibrillator is quite complex, based on two therapies: medical treatment based on antibiotic therapy and interventional treatment whether transvenous or surgical.

#### a- Medical Treatment:

In our series, antibiotic therapy was adapted to the microorganism involved when it was isolated, whereas, in situations where the germ research came back negative, probabilistic antibiotic therapy targeted staphylococcus and was based on:

- **Vancomycin 30mg/kg/d not to exceed 2g/d for 6 weeks. + Gentamycin 3-5mg/kg/d for 2 weeks. or**
- **Cephalosporin 3rd generation 2 g/d for 6 weeks. + Gentamycin 3-5mg/kg/d for 2 weeks**

#### b- Extraction:

All patients with CDRIE in our study were subjected to the extraction of stimulation material. In 11 out of 13 cases the extraction was performed by the endocavitory route, in two cases the extraction was performed by surgery.

#### c- Removal:

After clinical improvement, the negativity of blood cultures, and after a reassessment of cardiac implantable electronic devices (CIED) dependence; 11 of our patients out of 13 have been relocated to the contralateral side.

#### d- Post-extraction complication:

No complications were noted in our post-extraction patients.

## IV- Discussion:

### 1-Age:

The average age of onset of PVE in our series is 41.6 years, it is an age that is considered to be young compared to several series: 61 years (Nabin.K) [1], 68 years (Luciani.N) [2]. and 69 years old (Weber.C) [3] perhaps because in our context the primary reason for initial valve replacement was rheumatic valve disease in young patients.

The average age of occurrence CDRIE in our service is 59.6 years, this age is a bit young compared to what is reported in other series 69 years [4], 64 years (Bongiorni) [5], and 68 years (Wangh) [6], because in our series 31% of cases implanted at a young age for underlying pathologies hypertrophic cardiomyopathy (HCM), dilated cardiomyopathy (DCM).

### 2- Diagnosis:

#### 2.1- Clinical Data:

At the time of diagnosis, only 78% of patients in our department had a fever, which may have contributed to the delay in diagnosis. This figure is consistent with the series of LUCIANI N 74% (PVE) [7] and that of Nancy 67% (CDRIE) [8].

It is also found that 76% of patients with «CDRIE» had local signs of infection at the site of implantation. These results are consistent with the BONGIORNI 65% series [5].

#### 2.2- Blood culture data:

The results of our study are consistent with the results of several studies for either the PVE J.LOPEZ [9], M.NONAKA [10] ..., or on stimulation material J.C. CASTILLO [11] which all showed the responsibility of staphylococcus in early forms and the importance of streptococcus in late forms. The number of endocarditis called *negative* blood cultures varies according to the series. NABIN K [1] estimates that they represent 17% of the total PEFP and SOHAIL estimates that they represent 7% of the total CDRIE [12].

#### 2.3- Echocardiography data:

In our study, 45% of patients presented vegetations; and 13% showed disinsertion which is consistent with the NABIN study (45% vegetations and 11% of disinsertions). 3 periannular abscesses were highlighted on echocardiography or 13%, this percentage is low compared to the series of NABIN[1] 50.2% and LUICIANI[7] 32.2% this can be explained because in both series the PVE on aortic prosthesis (66% in LUICIANI) is greater than that of mitral PVE. Bearing in our series the percentage of IE on mitral prosthesis is the highest (60%).

### 3-Treatment:

#### 3.1- PVE:

In our study, antibiotic therapy consisted of a parenteral combination of bactericidal antibiotics for all patients. The nature of the antibiotics used was determined based on the time to onset of IE as recommended by ESC 2015 [13]. 18% of our patients have had surgery. According to the literature, this percentage is reduced compared to the LUICIANI series 45% of patients who had surgery.

### 3.2- CIED

The treatment of CDRIE is quite complex, based on two therapies: the medical treatment based on antibiotic therapy and the extraction of the probe either endocavitory or surgical. This therapeutic strategy is consistent with the latest EHRA consensus that was released in June 2020[14],

#### V- Conclusion:

Through this work and the literature review, we insist on the following points for practice:

Echocardiography must be systematic; the role of blood cultures is to isolate the germ and guide treatment.

The endocarditis team is necessary for good management with a view to a close collaboration between the cardiologists, the surgeon, the infectiologists, the microbiologists....

#### References:

- 1- Nabin K. Shrestha, MD, MPH, Shailee Y. Shah, MD, Syed T. Hussain, MD, Gosta B. Pettersson, MD, PhD, Brian P. Griffin, MD, Amy S. Nowacki, PhD, Steven M. Gordon, Association of Surgical Treatment with Survival in Patients with Prosthetic Valve Endocarditis a thorac Surg.2019.09.015.
- 2- Nicola Luciani, Eugenio Mossuto, Davide Ricci, Marco Luciani, Marco Russo, Antonio Salsano, Prosthetic valve endocarditis: predictors of early outcome of surgical therapy. A multicentric study Cite this article as: Luciani N, Mossuto E, Ricci D, Luciani M, Russo M, Salsano A et al. Prosthetic valve endocarditis: predictors of early outcome of surgical therapy. A multicentric study. Eur J Cardiothorac Surg 2017;52:768–74.
- 3- Carolyn Weber, MD, Georgi Petrov, MD MSc, Maximilian Luehr, MD, Hug Aubin, MD, Sems-Malte Tugtekin, MD, Michael A. Borger, MD PhD, Payam Akhyari, MD, Thorsten Wahlers, MD, Christian Hagl, MD, Klaus Matschke, MD, Martin Misfeld, MD PhD, for the study group CAMPAIGN(Clinical, Multicenter Project of Analysis of Infective Endocarditis in Germany) Surgical results for prosthetic versus native valve endocarditis – a multicenter analysis jtcvs.2019.09.186
- 4- Hussein AA, Baghd Y, Wazni OM, Brunner MP, Kabbach G, Shao M, Gordon S, Saliba WI, Wilkoff BL, Tarakji KG. Microbiology of cardiac implantable electronic device infections. JACC Clin Electrophysiol 2016;2:498–505.
- 5- DBongiorni MG, Tascini C, Tagliaferri E, Di Cori A, Soldati E, Leonildi A, Zucchelli G, Ciullo I, Menichetti F. Microbiology of cardiac implantable electronic device infections. Europace 2012;14:1334–1339.
- 6- Wang R, Li X, Wang Q, Zhang Y, Wang H. Microbiological characteristics and clinical features of cardiac implantable electronic device infections at a tertiary hospital in China. Front Microbiol 2017;8:360–360.
- 7- Nicola Luciani, Eugenio Mossuto, Davide Ricci, Marco Luciani, Marco Russo, Antonio Salsano, Prosthetic valve endocarditis: predictors of early outcome of surgical therapy. A multicentric study Cite this article as: Luciani N, Mossuto E, Ricci D, Luciani M, Russo M, Salsano A et al. Prosthetic valve endocarditis: predictors of early outcome of surgical therapy. A multicentric study. Eur J Cardiothorac Surg 2017;52:768–74.
- 8- Berivan AZMAN thèse : endocardite sur matériel de stimulation : à propos des cas révélés au CHU de Nancy entre 1998 et 2008
- 9- J LOPEZ, A REVILLA, I VILACOSTA, E VILLACORTA, C GONZALEZ-JUANATEY. Definition, clinical profile, microbiological spectrum, and prognostic factors of early-onset prosthetic valve endocarditis. Eur Heart J. 28 :760-765, 2007.
- 10- Nonaka M1, Kusuvara T, An K, Daisuke Nakatsuka Search articles by 'Daisuke Nakatsuka' Nakatsuka D, Sekine Y, Iwakura A, Yamanaka K Comparison between early and late prosthetic valve endocarditis: clinical characteristics and outcomes. The Journal of Heart Valve Disease, 01 Jul 2013, 22(4):567-574
- 11- Juan C. Castillo, MD, Manuel P. Anguita, MD, Francisco Torres, MD, Dolores Mesa, MD, Manuel Franco, MD, Emilio Gonzalez, MD, Ignacio Munoz, MD, and Federico Valles, MD Long-Term Prognosis of Early and Late Prosthetic Valve Endocarditis Am J Cardiol 2004;93:1185–1187.
- 12- H Muhammad R. Sohail, MD, Daniel Z. Uslan, MD, Akbar H. Khan, MD, Paul A. Friedman, MD, David L. Hayes, MD, Walter R. Wilson, MD, James M. Steckelberg, MD, Sarah Stoner, MS, Larry M. Baddour, MD Management and Outcome of Permanent Pacemaker and Implantable Cardioverter-Defibrillator Infections. Journal of the American College of Cardiology Vol. 49, No. 18, 2007
- 13- Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta JP, Del Zotti F, Dulgheru R, El Khoury G, Erba PA, Iung 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; ESC Scientific Document Group. 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.

14- Carina Blomstrom-Lundvist (Chair) et al. European Heart Rhythm Association (EHRA) international consensus document on how to prevent, diagnose, and treat cardiac implantable electronic device infections-endorsed by the Heart Rhythm Society. Europace (2020) 22,515-516 doi: 10.1093/europace/eur3246

