Case Report

# Prosthetic Aortic Valve Endocarditis With Extensive Para-Aortic Abscess: The Relevance of Multimodal Imaging

*Bernardo Boccalon,[1] André Barcellos Amon,[1] Thiago Ferreira Serafini,[1] Álvaro Schmidt Albrecht,[2] Murilo Foppa,[1,2] Angela Barreto Santiago Santos[1,2]*

*Programa de Pós-Graduação em Cardiologia e Ciências Cardiovasculares, Faculdade de Medicina da Universidade Federal do Rio Grande do Sul (UFRGS),[1] Porto Alegre, RS – Brazil*

*Hospital de Clínicas de Porto Alegre (HCPA),[2] Porto Alegre – Brazil*

## Introduction

Infectious endocarditis (IE) is defined as the infection of the endocardium or prosthetic material in the heart, whose pathogenesis is bacterial adherence to the vulnerable endocardium or implanted prosthetic material during a bacteremia.[1] Its clinical presentation is highly variable, depending on the micro-organism that causes it, underlying heart conditions and preexisting comorbidities.[2] The annual estimated incidence of IE is up to 10/100,000 in western countries, and mortality of up to 30% in 30 days.[3]

## Description

A 64-year-old woman searched for outpatient care due to cervical pain for three weeks, night sweats, shivering and myalgia. Besides, she complained of precordial pain, intensity 4/10, with a squeezing feeling. Her medical history showed a surgery to replace the aortic valve due to severe aortic stenosis (bicuspid aortic valve), carried out in August, 2018, with an implant of a Mosaic Ultra porcine biologic prosthesis n. 21 (Medtronic). The patient denied having had dental treatments or other invasive procedures in the past ten months.

At physical examination, the patient presented with 94 bmp heart rate (HR), blood pressure (BP) of 150/86 mmHg, with regular rhythm at heart auscultation and rude systolic murmur in the aortic focus, with 3/6+ intensity. As to the other systems, there was no neurological deficit, she was lucid and conscious, without skin changes suggestive of vascular/immunological phenomena, normal kidney function, as well as qualitative urine test.

The choice was to perform an ambulatory investigation of her clinical condition by collecting laboratory examinations, including peripheral blood culture and transthoracic echocardiogram (TTE) due to the hypothesis of IE. Laboratory examinations showed leukocytosis (total leukocyte count – 15,150 μg/L), with prevalence of neutrophils (11,910 μg/L) and increased C-reactive protein (CRP – 20.8 mg/L). Hemoglobin, electrolytes, creatinine and urea were within normal limits. There was increased *Streptococcus anginosus* in one of the blood culture samples, and TTE showed images that suggested vegetations in the aortic valve prosthesis. Therefore, the patient was admitted to a secondary health care institution and was started on intravenous antibiotic therapy with oxacillin, gentamicin and ceftriaxone, solving the initially presented clinic.

### Transfer to a tertiary hospital

The patient remained hospitalized for ten days until being transferred to a tertiary hospital to continue with evaluation and treatment. At arrival, the patient was hemodynamically stable, with no fever nor complaints about pain or dyspnea. At physical examination, she remained with systolic murmur in aortic focus, rude, 3/6+. There were no changes in other systems.

Laboratory examinations showed discreet leukocytosis (total leukocyte count – 11,580 μg/L), with prevalence of neutrophils (8,740 μg/L), besides high CRP (140 mg/L), but without increase in micro-organisms in the three pairs of collected blood cultures. The electrocardiogram showed sinus rhythm with normal PR interval, axis in -30º and without changes in ventricular repolarization. Chest x-ray with sternal suture wires, with no other changes.

The TTE performed at admission showed left ventricle with normal dimensions and parietal thickness, and preserved ejection fraction (66% through the Teichholz method). The biological aortic prosthesis presented images with independent mobility in its ventricular wall, suggestive of vegetations, besides mild transvalvular and minimum paravalvular regurgitation, with suspected structural obstructive dysfunction of the biological prosthesis (peak velocity of 3.8 m/s; maximum/medium gradients = 57/38 mmHg and velocity–time integral ratio (VTI) of 0.45; opening time = 112 ms).

The choice was for the maintenance of the antimicrobial treatment with ceftriaxone and gentamicin, with progressive reduction of CRP and normalization of the leukogram, remaining without fever until the 18th day of treatment, when the patient began presenting a subfebrile curve (37.6º) and changes in cardiac rhythm, alternating periods of bigeminy ventricular extrasystole, sinus rhythm and atrial fibrillation with high ventricular response.

## Keywords

Endocarditis; Heart Valve Prosthesis Implantation; Diagnostic Imaging

**Mailing Address: Bernardo Boccalon** •
Hospital de Clínicas de Porto Alegre. R. Ramiro Barcelos, 2350, Sala 2061. Postal code: 90035-903. Santa Cecília, Porto Alegre, RS – Brazil
E-mail: boccalonbernardo@gmail.com
Manuscript received July 9, 2023; revised manuscript August 1, 2023; accepted August 7, 2023
Editor responsible for the review: Daniela do Carmo Rassi Frota

**DOI:** https://doi.org/10.36660/abcimg.20230068i

For the evaluation of complications related to IE, a transesophageal echocardiogram (TEE) was performed and confirmed the hyperechogenic image adhered to the anatomic correspondent of the left coronary leaflet, moveable, with maximum diameter of 11 mm, suggestive of vegetation, and minimum paravalvular regurgitation. Besides, there was a posterior paraortic hyperechogenic structure involving the ascending aorta, with no flow in its interior, and maximum diameter of 24 mm, suggestive of abscess (Figure 1).

CTs with contrast were conducted for the accurate evaluation of the paraortic image. The changes that were found were suggestive of infectious collection in the aortic root and the left atrium wall, measuring 53x33 mm in the larger axis (Figure 2). There were images suggestive of abscesses in the upper third of the right kidney and the right upper lobe of the lung.

The patient was referred to emergency surgery, which identified a large abscess involving the aortic root, from the left coronary ostium to the right coronary, with disjunction of the aortic prosthesis and the left ventricular outflow tract (LVOT) in 90% of its circumference. Besides, there was presence of pannus in the subvalvular region, determining stenosis of the LVOT (Figure 3).

An aortic prosthesis resection was performed, with debridement of the paravalvular abscess, circumferential reconstruction of the LVOT from the muscle to the subcoronary plan, with a bovine pericardial patch and implant of biological aortic prosthesis n. 19.

The post-operative Evolution required the implantation of a definitive dual-chamber pacemaker due to a total persistent atrioventricular block. In spite of that, recovery was more satisfactory, and laboratory examinations showed no changes suggestive of ongoing infectious processes, normal functioning aortic prosthesis in TTE and hospital discharge after the antimicrobial therapy

## Discussion

The diagnosis of IE is challenging, because the early symptoms can be unspecific and variable. Signs such as persistent fever, night sweats, fatigue, weight loss and joint pain can indicate the condition. Medical history of the patient, including the presence of predisposing conditions, such as prosthetic heart valves or previous heart disease, increase the changes of diagnosis.[4]

The early collection of examinations, such as blood culture, aiming at the identification of the micro-organism that causes IE, is extremely important for the clinical

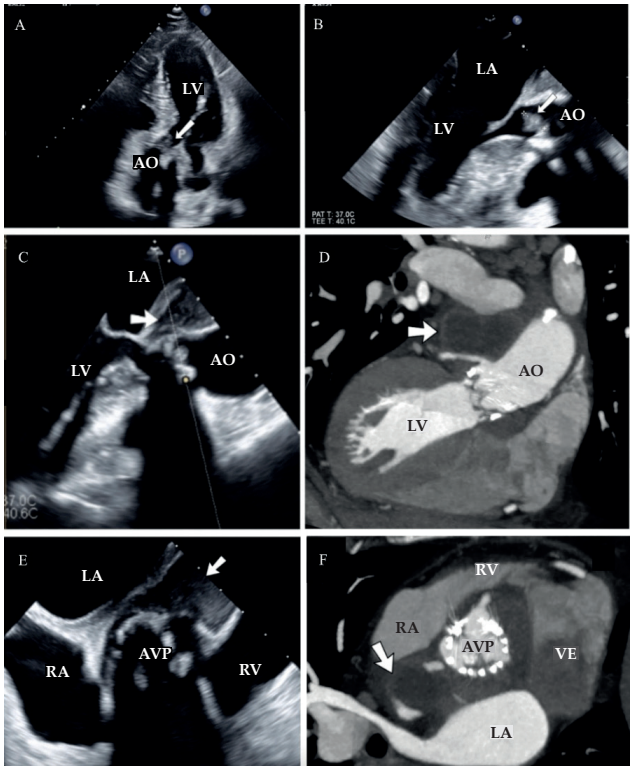


**Figure 1 –** *A) arrow indicating vegetation in the left ventricular outflow; B) visualized in the TTE and ETE; C e E) abscess between the anterior aortic wall and the left atrium visualized in the TEE; D e F) abscess between the anterior aortic wall and the left atrium visualized in computed tomography. AO: Aorta; LA: left atrium; RA: right atrium; LV: left ventricle; RV: right ventricle; AVP: aortic valve prosthesis.*

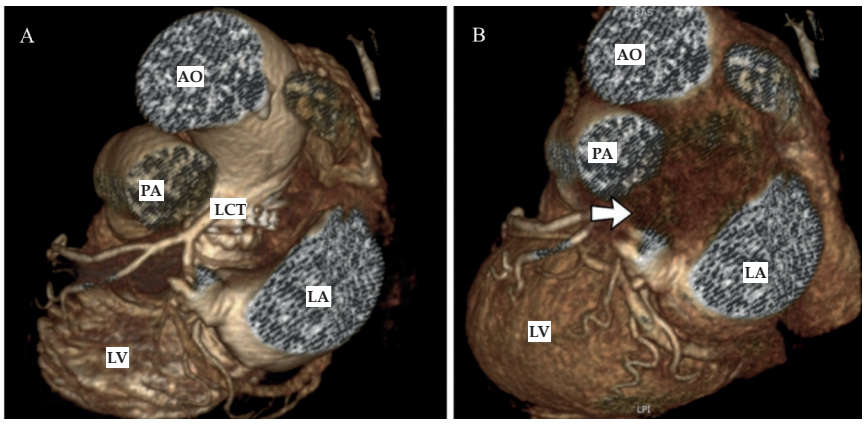


**Figure 2 –** *A) 3D renderization with superior view showing the aortic root and the origin of the left coronary artery; B) renderization showing the abscess (arrow) involving the aortic ring and the origin of the left coronary. LA: left atrium; LV: left ventricle; PA: pulmonary artery; AO: Aorta; LCT: left coronary trunk.*

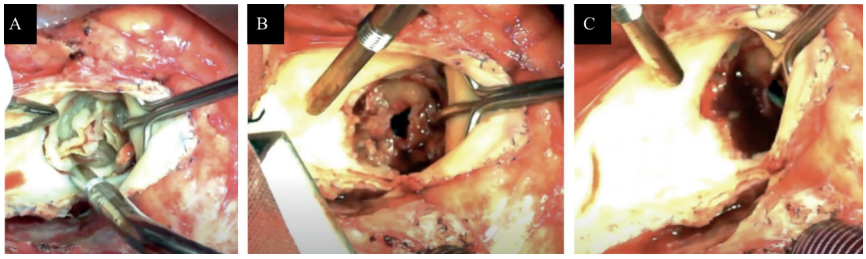


**Figure 3 –** *Vision by oblique aortotomy. A) Previous aortic prosthesis; B) Abscess, pus and subvalvular pannus after exeresis of the infected prosthesis; C) pus drainage from left infra-coronary abscess with fistulous tract towards the atrial roof (pseudoaneurysm).*

management of this condition, allowing an adequate antimicrobial treatment, which results in better outcomes for the patient. Even if IE caused by *Streptococcus anginosus* is relatively rare, when it occurs there are higher chances of the formation of perivalvular abscesses and higher mortality rates. These germs are uniformly susceptible to beta-lactam antibiotics, recommending the treatment with an antimicrobial of that class (in the case reported above, ceftriaxone was used), associated with gentamicin in the two first weeks of treatment.[5]

The imaging examinations are part of the diagnosis and follow-up, and echocardiogram is the examination of choice. However, it is important to recognize that endocarditis may present variations in clinical manifestation, which may affect the sensitivity of imaging examinations. Currently, the sensitivity for the diagnosis of vegetations in native and prosthetic valves is estimated in 70% and 50%, respectively, for TTE; and 96% and 92%, respectively, for TEE. The sensitivity of TTE for the diagnosis of abscesses is about 50%, in comparison to 90% of the TEE.[5] Other imaging modalities may be necessary, such as CT and cardiac magnetic resonance, especially in the evaluation of complications (abscess/pseudoaneurysm), as in the presented case, in which there is an increase in the accuracy of the anatomic details of these structures.[6,7] Patients with heart prostheses have higher chances of IE and of developing complications related to endocarditis, since the micro-organisms interfere in the perivalvular tissue when invading the prosthetic ring, which increases the risk of abscess, pseudoaneurysm, formation of fistula and valve dehiscence.[8] The mechanical complications of IE need to be considered in case of hemodynamic deterioration and/or absence of clinical improvement with the adequate antimicrobial treatment, or the onset of changes in cardiac rhythm in cases of aortic prosthesis, which should be treated at a reference center.[2]

The complications of IE are frequent causes of early surgical intervention before the conclusion of the antibiotic therapy, for being associated with higher mortality rates, embolic events and recurrence of IE in the first five years after the initial infection. Heart surgery aims at removing infected tissues, repairing or replacing non-functional valves and correcting abnormalities to restore the adequate heart function.[9]

Therefore, it is essential to pay attention to factors such as the presence of heart prosthesis, intracardiac complications and specific clinical conditions of the patient

to guarantee a comprehensive and assertive diagnostic approach of this condition. The judicious integration of clinical findings with the interpretation of imaging examinations allows a better assessment and therapeutic conduction for patients with suspected endocarditis.

## Author Contributions

Conception and design of the research: Boccalon B, Foppa M; acquisition of data: Boccalon B, Amon AB, Serafini T, Albrecht A, Foppa M, Santos ABS; a nalysis and interpretation of the data: Boccalon B, Amon AB, Foppa M; writing of the manuscript: Boccalon B, Serafini T; critical revision of the manuscript for intellectual content: Amon AB, Albrecht A, Foppa M, Santos ABS.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

### Sources of Funding

There were no external funding sources for this study.

### Study Association

This study is not associated with any thesis or dissertation work.

### Ethics Approval and Consent to Participate

This article does not contain any studies with human participants or animals performed by any of the authors.

## References

1. Østergaard L, Valeur N, Tuxen CD, Bundgaard H, Iversen K, Moser C, et al. Infective Endocarditis. Ugeskr Laeger. 2022;184(12):V10210751.
2. Rajani R, Klein JL. Infective Endocarditis: A Contemporary Update. Clin Med. 2020;20(1):31-5. doi: 10.7861/clinmed.cme.20.1.1.
3. Mostaghim AS, Lo HYA, Khardori N. A Retrospective Epidemiologic Study to Define Risk Factors, Microbiology, and Clinical Outcomes of Infective Endocarditis in a Large Tertiary-Care Teaching Hospital. SAGE Open Med. 2017;5:2050312117741772. doi: 10.1177/2050312117741772.
4. Larry MB, Anavekar NS, Crestanello JA, Wilson WR. Infectious Endocarditis and Infections of Indwelling Devices. In: Libby P, editor. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. New York: Elsevier; 2022. p. 1505-30.
5. Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta JP, Del Zotti F, et al. 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(44):3075-128. doi: 10.1093/eurheartj/ehv319.
6. Feuchtner GM, Stolzmann P, Dichtl W, Schertler T, Bonatti J, Scheffel H, et al. Multislice Computed Tomography in Infective Endocarditis: Comparison with Transesophageal Echocardiography and Intraoperative Findings. J Am Coll Cardiol. 2009;53(5):436-44. doi: 10.1016/j.jacc.2008.01.077.
7. Hryniewiecki T, Zatorska K, Abramczuk E, Zakrzewski D, Szyma□ski P, Ku□mierczyk M, et al. The Usefulness of Cardiac CT in the Diagnosis of Perivalvular Complications in Patients with Infective Endocarditis. Eur Radiol. 2019;29(8):4368-76. doi: 10.1007/s00330-018-5965-2.
8. Ivanovic B, Trifunovic D, Matic S, Petrovic J, Sacic D, Tadic M. Prosthetic Valve Endocarditis - A Trouble or a Challenge? J Cardiol. 2019;73(2):126-33. doi: 10.1016/j.jjcc.2018.08.007.
9. Otto CM, Nishimura RA, Bonow RO, Carabello BA, Erwin JP 3rd, Gentile F, et al. 2020 ACC/AHA Guideline for the Management of Patients with Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2021;143(5):e72-e227. doi: 10.1161/CIR.0000000000000923.