

CASE REPORT

Failed endocarditis prophylaxis before a dental procedure in a high-risk single-lung patient with a bioprosthetic heart valve: A rare case report

Anabel Pinter-Högerle¹ | Hartwig H. C. von Oehsen² | Benjamin A. Högerle³  | Rainer Breit⁴

¹Department of Anesthesiology, Heidelberg University Hospital, Heidelberg, Germany

²Department of Public Health, Saarlouis Municipal Council, Saarlouis, Germany

³Department of Anesthesiology, Heidelberg University Hospital, Heidelberg, Germany

⁴Department of Cardiology and Pneumology, Merzig Hospital, Merzig, Germany

Correspondence

Benjamin A. Högerle, Department of Anesthesiology, Heidelberg University Hospital, Im Neuenheimer Feld 420, 69120 Heidelberg, Germany.
Email: benjamin.hoegerle@med.uni-heidelberg.de

Funding information

None

Abstract

Regarding endocarditis prophylaxis, there is an increasing burden of enterococci related to antibiotic resistances. The testing of the bacterial milieu of the oral cavity before dental procedures may be promising to adjust the antibiotics.

KEYWORDS

antibiotic resistance, bioprosthetic heart valve, dentistry, endocarditis, enterococcus species

1 | INTRODUCTION

A patient had undergone pneumonectomy and subsequently a bioprosthetic mitral valve implantation. After a routine dental procedure, he developed a severe endocarditis due to enterococcus faecalis that was resistant to the standard antibiotic prophylaxis. The interdisciplinary vigilance for endocarditis associated with resistant enterococci must be increased especially in high-risk patients.

Infective endocarditis affects up to 10 per 100,000 people yearly. The 1-year mortality rate is estimated to be as

high as 30%.¹ Etiologically, infective endocarditis is induced by bacteremia that may originate from surgical procedures, including various dental procedures. Even minor dental procedures are known to induce a significant bacteremia.² Thus, in at-risk patients, an antibiotic endocarditis prophylaxis is recommended according to the latest guidelines of the European Society of Cardiology (ESC)³ and the American Heart Association (AHA).⁴ The definition of at-risk patients includes those who have had a prosthetic heart valve implantation. Before the dental procedure, the first-line antibiotic prophylaxis is generally

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *Clinical Case Reports* published by John Wiley & Sons Ltd.

amoxicillin or, in case of a penicillin hypersensitivity, clindamycin, to address the viridans group streptococci as the most common pathogenic bacteria associated with dental procedures. However, this treatment is not without controversy. For example, the heterogenous methodological quality and, hence, the limited evidence of many studies have been criticized.⁵

Studies indicate that the mortality associated with endocarditis of endogenous heart valves remains up to 25%.⁶ The mortality of endocarditis related to bioprosthetic heart valves is estimated to be up to 60%.⁷ To date, there are no data on the mortality of endocarditis of bioprosthetic heart valves in patients following pneumonectomy. Here, we report on the management of infective endocarditis in a high-risk patient 47 years after a pneumonectomy and subsequently three heart surgeries including a bioprosthetic heart valve implantation. To our knowledge, such a case has not been presented before.

2 | CASE REPORT

The patient was diagnosed with a malignant testicular tumor in 1964. Due to giant pulmonary metastases, a left-sided pneumonectomy was performed in 1968. Since then, a recurrent mitral valve (MV) regurgitation became manifest. Between 2000 and 2012, the patient subsequently underwent three heart surgeries for MV reconstruction and finally for implantation of a bioprosthetic MV. The patient recovered well.

In 2015, the patient was planned for a routine teeth restoration including the replacement of an inlay due to progressive caries. According to the latest guidelines, the patient was classified as a high-risk individual to whom antibiotic endocarditis prophylaxis should be provided. Before the dental procedure, clindamycin was administered instead of amoxicillin because of a known penicillin hypersensitivity. In the following days, the patient

developed a remittent fever. The antibiotic therapy with clindamycin was continued. As the fever persisted, the patient was admitted to the hospital. A transthoracic echocardiography (TTE) and a transesophageal echocardiography (TEE) were performed. The examinations were aggravated by the altered anatomical conditions after the pneumonectomy and three heart surgeries. Both TTE and TEE revealed a vegetative formation (size: 0.9 x 0.6 x 0.5 mm) of the bioprosthetic MV in the area of the former posterior mitral leaflet (PML; Figure 1). The left ventricular ejection fraction was known before to be compromised. A 18F-fludeoxyglucose (FDG) positron-emission tomography (PET)/computed tomography (CT) image excluded other inflammatory processes and confirmed a circular FDG hypermetabolism of the MV (maximum standardized uptake value [SUV_{max}]: 4.3; (Figure 2). Blood cultures were also immediately performed. The tests revealed a blood infection by enterococcus faecalis, which was, among others, resistant to clindamycin. Thus, the infective endocarditis diagnosis was made according to the modified Duke criteria.⁸ Considering the patient's antibiotic sensitivity, the patient received high-dose intravenous (IV) antibiotic therapy, including gentamicin. The dosage was adapted to the serum levels. Over time, the inflammation markers decreased. After two weeks, gentamicin was replaced by linezolid due to an increasing renal failure and an exanthema. Both symptoms then normalized rapidly. After four weeks of high-dose IV antibiotic therapy, we continued antibiotic therapy within the normal dosage range. By using TTE and TEE, it was not possible to detect any former vegetative formations of the valves. Since the patient had recovered well, he was discharged from the hospital. An oral antibiotic therapy was continued for four more weeks. All follow-up examinations remained uneventful.

Fifty-three years post-pneumonectomy and 6 years after the infective endocarditis of the bioprosthetic heart valve, the patient is in very good physical shape (New York

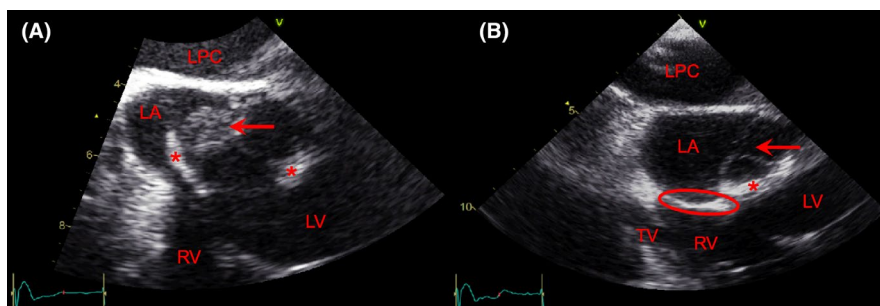


FIGURE 1 Transesophageal echocardiography. (A): The imaging clearly revealed a vegetative formation of the former posterior mitral leaflet (arrow). Due to the altered post-pneumonectomy anatomy, all images were recorded in atypical positions. (B): A 3 month follow up after high-dose antibiotic therapy. No vegetative formation pleural capacity, LV: left ventricle, RV: right ventricle, TV: tricuspid valve, *: annulus of the was detectable associated with the mitral valve (arrow). (LA: left atrium, LPC: left bioprosthetic mitral valve, encircled: pacemaker lead)

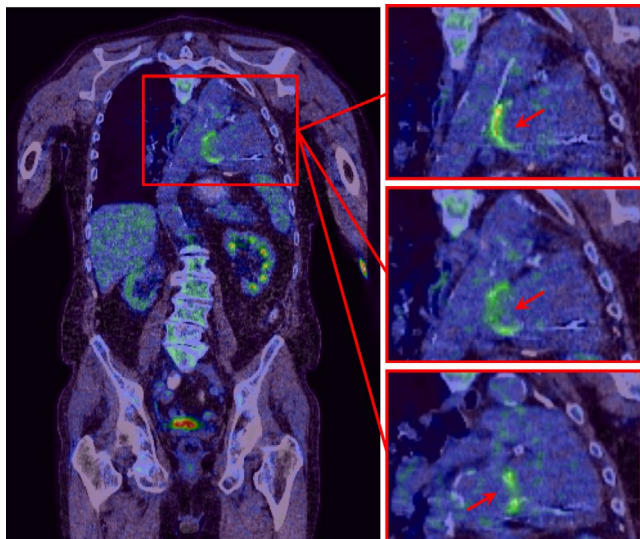


FIGURE 2 PET/CT imaging. The examination detected a circular inflammatory process in the area of the bioprosthetic mitral valve (magnifications, arrows)

Heart Association [NYHA] class II). Only a mild MV regurgitation is present. Since the renal failure, which was, in retrospect, very likely induced by gentamycin, a mild hyperuricemia has persisted.

3 | DISCUSSION

Dental procedures may still be underestimated in their tendency to induce infective endocarditis and severe complications. The current guidelines^{3,4} identify the viridans group streptococci as the most common pathogenic bacteria colonizing the oral cavity (20–40%).⁹ Infections by other bacteria, such as enterococci or staphylococci, are not primarily considered to be associated with dental procedures.¹⁰ However, studies detected an increasing enterococcal burden over time.⁶ High-risk patients in particular after multiple surgeries are prone to be colonized with less common bacteria, such as enterococcus faecalis in the present case. Furthermore, potential antibiotic resistances should be considered by the dentist. However, it is estimated that only 12% of the dentists adequately prescribe antibiotics for prophylaxis.¹¹ To face possible antibiotic resistances, past medical records should be evaluated at first. Additionally, antibiotics with extended spectra, for example, cephalexin, cefazolin, and ceftriaxone, are available, but enterococci are intrinsically resistant to cephalosporins. Vancomycin can be applied instead, but the proportion of resistant enterococci is rising. Tigecycline may be an antibiotic of last resort.¹² There are no definite recommendations regarding the prescription of antibiotics

in case of assuming a potential antibiotic resistance. The risk of an endocarditis especially in high-risk patients will usually outweigh the risk of newly induced antibiotic resistances. Complex cases may be discussed interdisciplinarily.

Retrospectively, in the present case, the microbiological testing of the bacterial milieu of the oral cavity before the dental procedure may have revealed the colonization with enterococcus faecalis and its antibiotic resistance to the standard endocarditis prophylaxis. This individual approach has not been included in the guidelines so far, but studies showed that the oral microbiota and their antibiotic susceptibility can be evaluated. The test is non-invasive and can be realized easily. The data may be suitable to adjust the antibiotic prophylaxis for endocarditis accordingly and to avoid the induction of new antibiotic resistances.^{13,14} After dental procedures, vigilance for endocarditis symptoms should be increased. On suspicion, a fast and thorough assessment, including an echocardiography and blood culture, should be performed. New imaging variants, such as a cardiac CT (sensitivity: up to 100%) or 18F-FDG-PET/CT (sensitivity: up to 97%), have significantly improved the diagnostics.¹⁵ In the present case, the patient underwent whole-body imaging with a PET/CT to confirm the diagnosis, but also to exclude other inflammatory processes and septic emboli that could have compromised this single-lung and heart failure patient. In retrospect, a labeled leukocyte single-photon emission CT (SPECT) would have been favored since, currently, it seems more appropriate for a suspected cardiovascular inflammation.¹⁶

ACKNOWLEDGMENTS

The authors would like to thank Samer Ezziddin, MD (Department of Nuclear Medicine, Saarland University Medical Center, Faculty of Medicine, Saarland University, Homburg, Saarland, Germany) for supplying the PET/CT imaging. The authors would also like to thank Hans-Joachim Schäfers, MD (Department of Thoracic and Cardiovascular Surgery, Saarland University Medical Center, Faculty of Medicine, Saarland University, Homburg, Saarland, Germany) for his great personal commitment. Published with written consent of the patient.

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Anabel Pinter-Högerle and Benjamin Högerle prepared the manuscript. Hartwig H. C. von Oehsen and Rainer Breit guided authors in writing the manuscript and proof-read the final manuscript.

ETHICAL APPROVAL

The patient was informed in detail, and he provided written consent.

DATA AVAILABILITY STATEMENT

The dataset used and analyzed during the current study is available from the corresponding author on reasonable request.

ORCID

Benjamin A. Högerle  <https://orcid.org/0000-0002-6224-1825>

REFERENCES

- Pant S, Patel NJ, Deshmukh A, et al. Trends in infective endocarditis incidence, microbiology, and valve replacement in the United States from 2000 to 2011. *J Am Coll Cardiol*. 2015;65(19):2070-2076.
- Schmidlin PR, Attin T, Wegehaupt FJ. Bacteremia risk in preventive and restorative dentistry – prevalence of bacteremia and systemic antibiotics: a review focusing on preventive and restorative dentistry. *Swiss Dent J*. 2019;129(12):1047-1052.
- Habib G, Lancellotti P, Antunes MJ, 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):3075-3128.
- Wilson W, Taubert KA, Gewitz M, et al. Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation*. 2007;116(15):1736-1754.
- Abdallah MN. Inconclusive evidence on using antibiotic prophylaxis before dental procedures to prevent infective endocarditis. *J Am Dent Assoc*. 2017;148(8):618-620.
- Habib G, Erba PA, Jung B, et al. Clinical presentation, aetiology and outcome of infective endocarditis. results of the ESC-EORP EURO-ENDO (European infective endocarditis) registry: a prospective cohort study. *Eur Heart J*. 2019;40(39):3222-3232.
- Kohli M, Mathur A, Kohli M, Siddiqui SR. In vitro evaluation of microbiological flora of orofacial infections. *J Maxillofac Oral Surg*. 2009;8(4):329-333.
- Holland TL, Baddour LM, Bayer AS, Hoen B, Miro JM, Fowler VG. Infective endocarditis. *Nat Rev Dis Primers*. 2016;2:16059.
- Cahill TJ, Baddour LM, Habib G, et al. Challenges in infective endocarditis. *J Am Coll Cardiol*. 2017;69(3):325-344.
- Baddour LM, Prendergast BD. Risk of infective endocarditis due to invasive dental procedures. *Circulation*. 2018;138(49):364-366.
- Koyuncuoglu CZ, Aydin M, Ipek Kirmizi N, et al. Rational use of medicine in dentistry: do dentists prescribe antibiotics in appropriate indications? *Eur J Clin Pharmacol*. 2017;73(8):1027-1032.
- Beganovic M, Luther MK, Rice LB, Arias CA, Rybak MJ, LaPlante KL. A Review of Combination Antimicrobial Therapy for Enterococcus faecalis Bloodstream Infections and Infective Endocarditis. *Clin Infect Dis*. 2018;67(2):303-309.
- Komiyama EY, Lepesqueur LSS, Yassuda CG, et al. Enterococcus species in the oral cavity: prevalence, virulence factors and antimicrobial susceptibility. *PoS One*. 2016;11(9):e0163001.
- Süzük S, Kaşkatepe B, Çetin M. Antimicrobial susceptibility against penicillin, ampicillin and vancomycin of viridans group streptococcus in oral microbiota of patients at risk of infective endocarditis. *Infez Med*. 2016;24(3):190-193.
- Aguadé Bruix S, Roque Pérez A, Cuéllar Calabria H, Pizzi MN. Cardiac ¹⁸F-FDG PET/CT procedure for the diagnosis of prosthetic endocarditis and intracardiac devices. *Rev Esp Med Nucl Imagen Mol*. 2018;37(3):163-171.
- Arnon-Sheleg E, Israel O, Keidar Z. PET/CT Imaging in soft tissue infection and inflammation-an update. *Semin Nucl Med*. 2020;50(1):35-49.

How to cite this article: Pinter-Högerle A, von Oehsen HHC, Högerle BA, Breit R. Failed endocarditis prophylaxis before a dental procedure in a high-risk single-lung patient with a bioprosthetic heart valve: A rare case report. *Clin Case Rep*. 2021;9:e04707. <https://doi.org/10.1002/ccr3.4707>