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Case report

Advances in medicine and positive natural selection: Prosthetic valve endocarditis due to biofilm producer *Micrococcus luteus*

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ABSTRACT

Over the past years there has been a considerable increase in the use of aortic bioprostheses for treating aortic valve disease. With the increasing use of implanted medical devices, the incidence of prosthetic valve endocarditis has also increased. This is accompanied by a shift in the microbiology of infectious endocarditis. *Micrococcus* species are usually regarded as contaminants from skin and mucous membranes that rarely cause infectious diseases, however, they have the capacity to create biofilms from prosthetic materials and hence, to cause disease. We report the case of a 54-year-old woman who developed native valve infective endocarditis due to *Micrococcus luteus*. To our knowledge, only 18 cases of *M. luteus* prosthetic valve endocarditis have been described, none in the English literature.

Introduction

In recent times, there has been a considerable increase in the use of aortic bioprostheses for treating aortic valve disease, and this tendency is likely to continue in the near future. Worldwide, more than 200,000 surgical aortic valve replacements are performed each year [1]. Prosthetic valve endocarditis (PVE) is associated with high mortality and its incidence has increased over the past years, mainly due to the increasing use of implanted medical devices. *Staphylococcus aureus* and coagulase-negative staphylococcus are the most common microorganisms associated with PVE [2]. *Micrococcus* species are usually regarded as contaminants from skin and mucous membranes that rarely cause infectious diseases such as bacteremia, endocarditis, pneumonia and septic arthritis [3]. *Micrococcus luteus* is a rare cause of infective prosthetic valve endocarditis. To our knowledge, only 18 cases of *M. luteus* prosthetic valve endocarditis have been described, none in the English literature [4,5].

Case description

A 54-year old female was brought to the hospital after an unwitnessed fall and fever. Past medical history was relevant for an aortic valve replacement with bioprosthetic valve complicated by complete heart block requiring permanent pacemaker placement five years before presentation. On admission, she was found with a temperature of 39.6 C, a heart rate of 100 bpm and leukocytosis 27.4 k/mm^3. Physical exam was unremarkable, except for a holosystolic murmur best audible over sternal border bilaterally and chronic venous insufficiency in lower extremities. Initial laboratories showed a procalcitonin of 23.9 ng/mL and a CRP of 12.1 mg/dL. Urinalysis did not show signs of infection, chest x-rays were negative for consolidations, and a viral panel was negative for respiratory viruses including RSV and influenza. She was started on broad-spectrum antibiotics: vancomycin and meropenem. Subsequently, blood cultures grew *Micrococcus luteus*, which was considered a skin contaminant at that point. However, after 5 days of broad-spectrum antibiotics, fever persisted. Given the presence of fever, positive blood cultures and a systolic murmur, infective endocarditis due to *M. luteus* was suspected. A transesophageal echocardiogram was performed, demonstrating small vegetation attached to the posterior leaflet. The patient was started on vancomycin 1750 mg every 24 h and rifampin 600 mg every 24 h. Her condition improved within the first few days, she became

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afebrile and white blood cell count improved. Follow-up blood cultures were negative. She received a course of 8 weeks of vancomycin and rifampicin. Regular clinical follow-up was normal.

Discussion

Prosthetic valves account for up to 34 % of all cases of infective endocarditis and it is accompanied by hospital mortality as high as 50 %. The microbiology of PVE is very different from native valve endocarditis (NVE), moreover, the microbiology of early-onset PVE (<2 months), intermediate-onset PVE (2–12 months) and late-onset PVE (>12 months) are also different. In the report by Lee [6] the most frequent infecting organisms after 1 year were *Staphylococcus aureus* (30 %), nonenterococcal streptococci (25 %, with 16 % viridans), coagulase-negative staphylococcus (13 %) and Enterococcus (10 %).

Micrococcus species, members of the family Micrococcaceae, are gram-positive cocci, catalase-positive, arranged in tetrad clusters. They can be differentiated from Staphylococcus due to their inability to produce acid from glucose in anaerobiosis, their resistance to lysostaphin and furazolidone, their sensibility to bacitracin, and positive modified oxidase test [5]. *M. luteus* is commonly regarded as a contaminant from the skin and mucous membranes [3]. Although of low virulence, it has been previously documented as a pathogen capable to colonize prosthetic valves and native valves in immunocompromised patients [7,8,10].

Micrococcus species have the capability to form biofilms with a prosthetic material, which could explain why most of the reported cases are with prosthetic valves [8]. In biofilms, cells grow in multicellular aggregates that are encased in an extracellular matrix produced by the bacteria. Formation of biofilms on medical devices often results in difficult-to-treat infections, mainly due to the numerous benefits that a bacterial community might obtain from the formation of biofilms including resistance to antibiotics, protection from protozoan grazing, and protection against host defenses [9].

There is no defined therapeutic regimen for infective endocarditis. In contrast to staphylococci, it is usually penicillin-sensitive and also has been reported to be susceptible to aminoglycosides, clindamycin, tetracycline, ofloxacin, ciprofloxacin, trimethoprim-sulfamethoxazole, rifampin, and fusidic acid [3,11]. Most of the previously reported cases, including this case, were successfully treated with a combination of vancomycin and rifampin. This regimen was selected based on documented susceptibilities and the ability of rifampin and vancomycin to penetrate biofilms [12,13].

This case exemplifies how human activity (in this context advances in medicine and the increasing use of bioprosthetic medical devices) influences our Milieu intérieur and has an impact on evolutionary adaptation and positive natural selection, favoring that bacteria that are not usually pathogenic, such as *Micrococcus luteus,* are now more fit to cause disease in immunocompetent patients.

Informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request

Author contribution

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Furthermore, each author certifies that this material or similar material has not been and will not be submitted to or published in any other publication.

Ethical approval

Our institution does not require ethical approval for case reports

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CRediT authorship contribution statement

Guillermo Rodriguez-Nava: Conceptualization, Writing - original draft, Writing - review & editing. **Abdelnasir Mohamed:** Conceptualization, Writing - review & editing. **Maria Adriana Yanez-Bello:** Writing - review & editing. **Daniela Patricia Trelles-Garcia:** Writing - review & editing.

Declaration of Competing Interest

No conflict of interest was declared by the authors.

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References

[1] Rodriguez-gabella T, Voisine P, Puri R, Pibarot P, Rodés-cabau J. Aortic bioprosthetic valve durability: incidence, mechanisms, predictors, and management of surgical and transcatheter valve degeneration. J Am Coll Cardiol 2017;70(8):1013–28, doi:http://dx.doi.org/10.1016/j.jacc.2017.07.715.
[2] Moussa Y, Moussa M, Chakra MA. Enterococcal prosthetic valve endocarditis secondary to transurethral prostatic resection. IDCases 2020;19:e00708, doi:http://dx.doi.org/10.1016/j.idcr.2020.e00708.
[3] Von eiff C, Kuhn N, Herrmann M, Weber S, Peters G. Micrococcus luteus as a cause of recurrent bacteremia. Pediatr Infect Dis J 1996;15(8):711–3, doi:http://dx.doi.org/10.1097/00006454-199608000-00019.
[4] Seifert H, Kaltheuner M, Perdreau-Remington F. Micrococcus luteus endocarditis: case report and review of the literature. Zentralbl Bakteriol 1995;282(October (4)):431–5, doi:http://dx.doi.org/10.1016/s0934-8840(11)80715-2.
[5] Usó J, Gil M, Gomila B, Tirado MD. [Endocarditis due to Micrococcus luteus]. Enferm Infecc Microbiol Clin 2003;21(2):116–7, doi:http://dx.doi.org/10.1016/S0213-005X(03)72895-X.
[6] Lee JH, Burner KD, Fealey ME, et al. Prosthetic valve endocarditis: clinicopathological correlates in 122 surgical specimens from 116 patients (1985–2004). Cardiovasc Pathol 2011;20(1):26–35, doi:http://dx.doi.org/10.1016/j.carpath.2009.09.006.
[7] Miltiadous G, Elisaf M. Native valve endocarditis due to Micrococcus luteus: a case report and review of the literature. J Med Case Rep 2011;5:251, doi:http://dx.doi.org/10.1186/1752-1947-5-251.
[8] Ianniello NM, Andrade DC, Ivancic S, Eckardt PA, Lemos ramirez JC. Native valve infective endocarditis due to Micrococcus luteus in a non-Hodgkin's lymphoma patient. IDCases 2019;18:e00657, doi:http://dx.doi.org/10.1016/j.idcr.2019.e00657.
[9] López D, Vlamakis H, Kolter R. Biofilms. Cold Spring Harb Perspect Biol 2010;2(7)a000398, doi:http://dx.doi.org/10.1101/cshperspect.a000398.
[10] Khan A, Aung TT, Chaudhuri D. The first case of native mitral valve endocarditis due to Micrococcus luteus and review of the literature. Case Rep Cardiol 2019;2019:5907319, doi:http://dx.doi.org/10.1155/2019/5907319.
[11] Dürst UN, Bruder E, Egloff L, Wüst J, Schneider J, Hirzel HO. Micrococcus luteus: a rare pathogen of valve prosthesis endocarditis. Z Kardiol 1991;80(4)294–8 PMID: 1862670.
[12] Zheng Z, Stewart PS. Penetration of rifampin through Staphylococcus epidermidis biofilms. Antimicrob Agents Chemother 2002;46(3):900–3, doi:http://dx.doi.org/10.1128/AAC.46.3.900-903.2002.
[13] Darouiche RO, Dhir A, Miller AJ, Landon GC, Raad II, Musher DM. Vancomycin penetration into biofilm covering infected prostheses and effect on bacteria. J Infect Dis 1994;170(3):720–3, doi:http://dx.doi.org/10.1093/infdis/170.3.720.