Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
A case of Kytococcus schroeteri prosthetic valve endocarditis in a patient with COVID-19 infection

Sweta Shah a,*, Pooja Thakkara a, Sushima Poojarya a, Tanu Singhal b

a Microbiology Department, Kokilaben Dhirubhai Ambani Hospital and Research Institute, Achyutrao Patwardhan Marg, Andheri West, Mumbai 400053, Maharashtra, India
b Infectious Disease Department, Kokilaben Dhirubhai Ambani Hospital and Research Institute, Achyutrao Patwardhan Marg, Andheri West, Mumbai 400053, Maharashtra, India

ARTICLE INFO

Keywords:
Kytococcus schroeteri
COVID-19
Infective endocarditis

ABSTRACT

64 years old male presented fever, gastrointestinal symptoms, COVID-19 infection with bioprosthesis mitral in situ, cardio embolic stroke 2 years ago. The 2 D ECHO showed a vegetation indicating infective endocarditis. Three paired blood cultures grew Kytococcus schroeteri. The organism was sensitive to Vancomycin, Teicoplanin, Gentamycin and Linezolid. Patient had multiorgan dysfunction which further deteriorated into failure, disseminated intravascular coagulation resulting into death of the patient.

1. Introduction

Kytococcus schroeteri, a gram positive coccus belonging to the family Dermacoccaceae, is pathogenic in patients with implants or prosthesis and or immunocompromised patients. We present here a case of a 64 year old male with COVID-19 mitral valve endocarditis due to Kytococcus schroeteri (K.schroeteri). The aim of this article is to sensitize microbiologists and clinicians about this emerging bacterial pathogen.

2. Case report

A 64 years old male presented in January 2022 with history of fever of 5 days duration, poor appetite, constipation, rectal prolapse and per rectal bleeding of 10 days duration. This patient had a bioprosthesis mitral valve replacement 8 years ago and had an episode of cardio embolic stroke 2 years ago. He tested positive for COVID-19 RT PCR (Ct value of 18) and was admitted to the isolation ward. He was icteric but had no tachypnea or hypoxia. His initial investigations revealed compromised liver function (Total Serum Bilirubin 8.7 mg/dl, Direct Serum Bilirubin 7.8 mg/dl) and compromised renal (Serum Creatinin 1.8 mg/dl) function. Since the hepatic and renal dysfunction in the absence of significant hypoxia could not be explained by COVID-19, further investigations for cause of fever were conducted. The 2 D ECHO showed a mobile echogenic structure on the anterior mitral leaflet measuring 0.8 cm–1.8 cm compatible with a vegetation. Three paired blood cultures were sent and processed in automated blood cultures system, Bactec, BD ltd, USA. Empirical therapy with Meropenem and Vancomycin was initiated pending culture reports. He deteriorated quickly and developed hematuria, nasal bleeding and rectal bleeding following which he mandated supportive care with blood products transfusion and mechanical ventilation. Despite all these measures, the disseminated intravascular coagulopathy worsened; he had severe hematemesis, shock and multi-organ dysfunction and succumbed to the illness on the 7th day of hospitalization. A summary of hematological and biochemical investigations is tabulated (Table 1) which depicts patients clinical condition over the week. All six aerobic blood cultures flagged positive after 3 days of blood collection and were smear positive for gram positive cocci. Subcultures on 5% Sheep blood agar (Biomerieux ltd, France) showed muddy yellow, circular, convex, smooth colonies. The gram stain showed gram positive cocci in pairs and tetrads. Identification from colonies on each plate was done individually by VitekMS (MALDIToF, Biomerieux ltd, France). Two spots were plotted on the slide from each plate to ensure reproducibility. Growth from all the blood cultures were identified as Kytococcus schroeteri (confidence was 99.9%). Antimicrobial susceptibility was done by Kirby Baur Disc Diffusion Method. Since the breakpoints for Kytococcus are not available, breakpoints for Staphylococcus were utilized for interpretation. The organism was sensitive to Vancomycin, Teicoplanin, Gentamycin and Linezolid and was resistant to Penicillin, Ampicillin, Cefotaxime, Clindamycin, Erythromycin and...
Comorbidities in infected patients include diabetes mellitus [8,13], chronic adrenal insufficiency [14], adrenal hyperplasia [16], splenectomy [12], heart failure, renal failure, age (>60 years), hypertension, chronic obstructive pulmonary disease, use of oral anti-coagulation, immunosuppression, and long-term corticosteroid usage. The review of literature by Shelly Bagelman et al. [4] alludes that six unrelated cases of K. schroeteri endocarditis were treated with various combinations of antimicrobial therapy. In our case, it took 3 days for growth in blood culture bottle and another 2 days for growth on agar media and identification. A direct identification protocol from blood culture by MALDIToF and direct sensitivity by Kirby Baur Disc Diffusion method might have reduced the identification and sensitivity time from 5 days to 3–4 days. However, with the preliminary identification of Kytococcus, it would have been considered a contaminant until second blood culture grew the same bacteria. Hence in our case, this protocol could not have changed the outcome.

Table 1

| Investigations                      | Day 2   | Day 4   | Day 5   | Day 6   | Day 7   |
|-------------------------------------|---------|---------|---------|---------|---------|
| Hb (g/dL)                           | 13.3    | 7.7     | 8.8     | 9.5     | 9.3     |
| WBC (10⁹/µL)                        | 28,600  | 31,250  | 28,340  | 27,300  | 35,030  |
| platelet (10³/µL)                   | 24,000  | 108,000 | 98,000  | 355,000 | 38,000  |
| INR                                 | 1.8     | 1.63    | 1.42    | 1.89    | 2.26    |
| CRP (mg/dL)                         | 13.9    | 9.09    |         |         |         |
| S.Creatinine (mg/dL)                | 1.82    | –       | 1.89    | –       | 1.2     |
| S.Bilirubin (mg/dL)                 | 8.77    | 13.71   | –       | –       | 19.97   |
| S.Direct Bilirubin (mg/dL)           | 7.8     | 11.89   | –       | –       | 16.8    |
| Serum Aspartate                     | 356     | 469     | 4124    | 7234    |         |
| Aminotransferase (AST) (U/L)        |         |         |         |         |         |
| Serum Alaine                        | 153     |         | 167     | 771     | 1055    |
| Aminotransferase (ALT) (U/L)        |         |         |         |         |         |

Cotrimoxazole. MIC values were not determined. PCR or whole genome sequencing were not done to confirm the identification.

3. Discussion

The salient features of our patient are endocarditis with an unusual organism, rapidly progressive and fatal outcome due to multi-organ dysfunction, intravascular coagulopathy and coinfection with COVID-19.

The Kytococcus genus comprise of gram positive non encapsulated and nonmotile cocci, were first distinguished from the Micrococcus species in 1995 [1]. The genus is now known to include three species, K. schroeteri, K. sedentarius and K. aerolatus. There may be more unclassified and uncultured variants [3]. Kytococcus Schroeteri was first identified by 16S rDNA analysis in 2002 in a patient with prosthetic valve endocarditis [2]. It is usually a commensal [3] but can be pathogenic in patients with implants/prosthesis or immunocompromised patients. Identification of Kytococcus is not possible with manual methods or with automated identification systems. Unavailability of MALDIToF/PCR or whole genome sequencing technologies may lead to underreporting. Treatment for Kytococcus Schroeteri also poses challenges as it relatively slow growing bacteria, antimicrobial resistance and unavailability of standard susceptibility breakpoints [2,4]. Breakpoint of staphylococcus are used to interpret susceptibility as per other case reports [4].

Infections with Kytococcus Schroeteri are uncommon. Bagelman, S et al. [4] in his systematic review of publications in the last 17 years has reviewing 22 cases. Reported cases have mostly been infections of patients with implants/prosthesis or immunocompromised patients. In this context sensitization of microbiologist and clinicians and standardization of diagnosis, susceptibility testing and treatment are urgently needed.

Conflict of interest
None declared.

References

[1] Stackebrandt E, Koch C, Gvozdik O, Schumann P. Taxonomic Dissection of the Genus Micrococcus: Kocuria gen. nov., Nesterenkonia gen. nov., Micrococcus gen. nov., Dermacoccus gen. nov., and Micrococcus Cohn 1872 gen. emend. Int J Syst Bacteriol 1996;46(1). https://doi.org/10.1099/00207713-46-1-366. 366
[2] Szczerba I. Occurrence and number of bacteria from the Micrococcus, Kocuria, Nesterenkonia, Kytococcus and Dermacoccus genera on skin and mucous membranes in humans. Med Dosw Mikrobiol 2003;50(1):67–74.
[3] Bouker AM, Robert M, Teteneva NA, Danilova ND, Zhurina MV, Mart Yanov SV, et al. Draft genome sequence of Kytococcus Schroeteri strain H01, isolated from human skin. Microb Resour Announce 2019;8:40. doi: https://doi.org/10.1128/MRA.01081-19.
[4] Bagelman S, Zivgule-Neideger G. Insight into Kytococcus Schroeteri infection management: a case report and review. Infect Dis Rep 2021;13(1):230–8. https://doi.org/10.11589/idr20210020.
[5] Becker K, Schumann P, Wüllenweber J, Schulte M, Weil H-P, Stackebrandt E, et al. Kytococcus Schroeteri sp. nov., a novel Gram-positive actinobacterium isolated from a human clinical source. Int J Syst Evol Microbiol 2002;52(Pr 5):1609–14. https://doi.org/10.1099/00207713-52-5-1609.
[6] Becker K, Wüllenweber J, Odenthal H-J, Moeller M, Shumann P, Peters G, et al. Prosthetic valve endocarditis due to Kytococcus Schroeteri. Emerg Infect Dis 2003; 9(11):1493–5. https://doi.org/10.3201/eid0911.020683.

[7] Mnif B, Boujelbene I, Mahjoubi F, Gdoura R, Trabelsi I, Moalla S, et al. Endocarditis due to Kytococcus Schroeteri: case report and review of the literature. J Clin Microbiol 2006;44(3):1187–9. https://doi.org/10.1128/JCM.44.3.1187-1189.2006.

[8] Aepinus C, Adolph E, von Eiff C, Podbielski A, Petzsch M. Kytococcus Schroeteri: a probably underdiagnosed pathogen involved in prosthetic valve endocarditis. Wien Klin Wochenschr 2008;120(1–2):46–9. https://doi.org/10.1007/s00508-007-0903-3.

[9] Liu JC, Jenkins DR, Malnick H, Kovac J, Szostek J. Kytococcus Schroeteri endocarditis successfully managed with daptomycin: a case report and review of the literature. J Med Microbiol 2012;61(5):750–3. https://doi.org/10.1099/jmm.0.035493-0.

[10] Mohammed First report of Kytococcus Schroeteri prosthetic valve endocarditis in Oman Al Tamtami WN, Al Yaquobi F, Al Jardani A, editors. J. JMicrobiol Exp. 2019;7(5):247–8.

[11] Refaat M, Zakka P, Khoury M, Chami H, Mansour S, Harbiseh B, et al. Cardiac implantable electronic device infections: observational data from a tertiary care center in Lebanon. Medicine (Baltimore) 2019;58(16):e14906. https://doi.org/10.1097/MD.00000000000014906.

[12] Amaraneni A, Malik D, Jasra S, Chandana SR, Garg D. Kytococcus Schroeteri bacteremia in a Patient with hairy cell leukemia: a case report and review of the literature. Case Rep. Infect Dis. 2015;2015: https://doi.org/10.1155/2015/217307.

[13] Jacquier H, Allard A, Richette P, Ea HK, Sanson-Le Pors MJ, Berçot B. Postoperative spondylodiscitis due to Kytococcus Schroeteri in a diabetic woman. J Med Microbiol 2010;59(Pt 1):127–9. https://doi.org/10.1099/jmm.0.01454-0.

[14] Shah AS, Vijayavargiya P, Jung S, Wilson JW. Postoperative hardware-related infection from Kytococcus Schroeteri: its association with prosthetic material and hematological malignancies-a report of a case and review of existing literature. Case Rep. Infect Dis. 2019;2019(6936472). https://doi.org/10.1155/2019/6936472.

[15] Chan JFW, Wong SSY, Leung SSM, Fan RYY, Ngn AHY, To KKW, et al. First report of chronic implant-related septic arthritis and osteomyelitis due to Kytococcus Schroeteri and a review of human K. Schroeteri infections. Infection 2012;40(5):567–73. https://doi.org/10.1007/s15010-012-0250-9.

[16] Bayraktar B, Dalgic N, Duman N, Petmezci E. First case of bacteremia caused by Kytococcus Schroeteri in a child with congenital adrenal hyperplasia. Pediatr Infect Dis J 2018;37(12):e304–5. https://doi.org/10.1097/INF.0000000000002014.

[17] Schaumburg F, Schmalstieg C, Feddler B, Brentrup A, Omran H, Becker K. A bumpy road to the diagnosis of a Kytococcus Schroeteri shunt infection. J Med Microbiol 2013;62(1):165–8. https://doi.org/10.1099/jmm.0.045351-0.

[18] Jourdain S, Miendje Deyi VY, Musampa K, Wauters G, Denis O, Lepage P, et al. Kytococcus Schroeteri infection of a ventriculoperitoneal shunt in a child. Int J Infect Dis 2009;13(4):e153–5. https://doi.org/10.1016/j.ijid.2008.09.004.

[19] Li C, He Q, Qian H, Liu J. Overview of the pathogenesis of COVID-19 (review). Exp Ther Med 2021;22:1011–3. https://doi.org/10.3892/etm.2021.10444.