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Case Report

A case of *Kytococcus schroeteri* prosthetic valve endocarditis in a patient with COVID-19 infection

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ABSTRACT

64 years old male presented fever, gastrointestinal symptoms, COVID-19 infection with bioprosthetic 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 bioprosthetic 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 culture 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

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Table 1
Summary of hematological and biochemical investigations.

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 (10^3/μL)	28,800	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 Aminotransferase (AST) (U/L)	356	–	469	4124	7234
Serum Alaeine Aminotransferase (ALT) (U/L)	153	–	167	771	1055

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. schreoteri, 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 a 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 prosthetic valves [5,6,9,10] cardiac implantable electronic devices (CIED) [11]/rheumatic valvular heart disease. Additionally Central venous catheters [12]/chemotherapy port infections in immunocompromised patients leading to bacteremia and pneumonia have been described [4,12]. Orthopedic infections including spondylodiscitis [13], artificial silicon tendon tissue infections, infections of intra medullary nails chronic osteomyelitis [14,15]. Infections associated with ventriculo-peritoneal shunt among pediatric patients have also been reported [17,18]. 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 anticoagulation, immunosuppression, and long-term corticosteroid usage.

The review of literature by Shelly Bagelman et al. [4] alludes that six patients out of eight patients who were reviewed, were immunocompromised and had developed pneumonia and bacteremia succumbed to the infection. All eight patients with endocarditis and three patients with orthopedic infections recovered. One patient out of three with venticulo peritoneal shunt who had adrenal hypoplasia did not survive.

The risk factor in our patient was the presence of a prosthetic valve. While COVID-19 has not been previously described as a risk factor, it may have contributed to the unusually rapid deterioration of multi-organ dysfunction in this patient. COVID-19 is known to increase the risk of secondary bacterial and fungal infections even in the absence of immunosuppressive therapy by virtue of its ability of causing lymphopenia, endothelial damage and vascular thrombosis [19].

Our patient did not have any other immunocompromised illness. However, he had multi-organ dysfunction at the time of admission. Although patients with endocarditis have survived and recovered as per literature, dual infection of SARSCoV 2 and *Kytococcus schroeteri* endocarditis in underlying condition of coagulopathy and multi-organ dysfunction proved fatal to our patient despite ongoing supportive treatment as required along with blood product transfusion, Remdesivir, and antimicrobial like Meropenem and Vancomycin which were started at the time of admission.

The delay in identification of the bacteria poses a challenge for 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.

This delay has been observed in other studies as well. Besides, the organism is often dismissed as a contaminant as it is indistinguishable from micrococcus and dermatococcus and more so when a single blood culture is sent [6,16,17]. We therefore recommend that in the appropriate clinical setting isolate identified as micrococcus/dermatococcus should be evaluated further with repeat cultures and MALDIToF or molecular tools like 16srDNA before dismissing it as a contaminant.

Another challenge in treating kytococcus as lack of data on antimicrobial susceptibility and absence of susceptibility breakpoints. Most studies have used staphylococcal breakpoint as reference as specific breakpoints are not available [4,13,14]. These isolates are resistant to penicillin unlike Micrococcus. Multidrug efflux pumps play an important role in resistance [4,12]. Previously reported cases of K. schroeteri endocarditis were treated with various combinations of antimicrobial like vancomycin [6,8,10], gentamicin [6,8,10], doxycycline [17], ofloxacin [13], pristinamycin [7], daptomycin [9,14]. Our patient succumbed to his illness despite receiving vancomycin as part of empirical therapy for infective endocarditis.

Kytococcus. schroeteri is likely to emerge as an important bacterial pathogen due to widespread use of implants and increasing population of immunosuppressed patients. In this context sensitization of microbiologists and clinicians and standardization of diagnosis, susceptibility testing and treatment are urgently needed.

Conflict of interest

None declared.

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