DOI: 10.7860/JCDR/2022/58755.17148

Case Report

Microbiology Section

Aerococcus viridans Bacteraemia in a COVID-19 Positive Patient: A Rare Case Report from Northern India

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ABSTRACT

Aerococcus viridans is a rare Gram positive microorganism identified largely as environmental or skin contaminants. With the advent of an increase in the immunosuppressed population due to diabetes, the use of steroids and the Coronavirus Disease 2019 (COVID-19) pandemic, this bacteria caused a variety of infections like bacteraemia, urinary tract infections, and endocarditis. The use of Matrix-Assisted Laser Desorption Ionisation Time-of-Flight Mass-Spectrometry (MALDI-TOF MS), a unique technique of microorganism identification, has placed Aerococci among human pathogens, capable of causing infection among immunocompromised patients. The present case was of a 48-year-old female presented with dry cough, high-grade fever associated with chills and rigors, and generalised body ache and weakness for the past one week. She was a known case of bronchial asthma. She tested positive for COVID-19 and over the course of hospital stay, her BACTEC blood culture performed due to high fever which flagged positive indicated her as a case of *Aerococcus viridans* bacteraemia. Despite of all the efforts she developed respiratory distress followed by an episode of asystole following which she could not be revived.

Keywords: Antibiotic sensitivity testing, Bronchial asthma, Coronavirus disease 2019, Dry cough, Fever

CASE REPORT

A 48-year-old female presented to the Internal Medicine Outpatient Department with dry cough, high-grade fever associated with chills and rigors, and generalised body ache and weakness for the past one week. The patient was a known case of bronchial asthma. She also had shortness of breath on exertion from five days, which got worsened by respiratory distress at rest for the past two days. She came to the COVID-19 testing facility where she tested positive for COVID-19. As oxygen saturation was more than 94%, she was managed at home as a case of COVID-19 pneumonia with oral doxycycline 100 mg twice daily, oral azithromycin 500 mg once daily, intravenous paracetamol 10 mg/mL and within 5 to 10 minutes of starting administration, continuous monitoring of oxygen saturation was being performed at home. She also had a family history of type 2 diabetes mellitus but was not diagnosed as diabetic. After two days of home isolation, when her oxygen saturation dipped to 82%, she was admitted to a COVID-19 treatment facility at a 1600 bedded teaching hospital in Northern India. On admission, pulse rate was raised to 114/min and blood pressure was 108/68 mmHg and her respiratory rate and oxygen saturation on ambient air was 24 per min and 80% respectively.

She was started on high flow oxygen up to 10 L/min, administered through nasal prongs, with i.v. ceftriaxzone and remdesivir therapy as per standard treatment protocol for COVID-19 disease at the centre. Due to a further decrease in her oxygen saturation to 78% on the second day after admission, she was started on methylprednisolone pulse therapy and enoxaparin 60 mg/0.6 mL administered subcutaneously once daily. Her routine investigations were sent for biochemical investigations as a standard protocol which showed elevated levels of dimer and fibrinogen along with raised total leukocyte count and procalcitonin levels which pointed towards the development of secondary bacterial infection [Table/Fig-1]. Further, her stay in the ward was prolonged due to a high fever ranging from 102° to 104° occurring every 8 hrs for three days. Her oxygen saturation further dropped to 74% on fifth day after admission, when high flow oxygen up to 16 L/min was administered and further fall in the blood pressure to 100/65 mmHg was noted over the course of hospital stay due to which she was put on Non Invasive Ventilation (NIV). To confirm the diagnosis of secondary bacterial infection, a pair of BACTEC bacterial cultures was sent to the Department of Microbiology which flagged positive within 36 hrs of incubation. A direct smear from the blood culture bottles revealed Gram positive cocci [Table/Fig-2], and was subcultured on blood agar to obtain α haemolytic colonies [Table/Fig-3] that were further identified as *Aerococcus viridians* by Matrix-Assisted Laser Desorption Ionization Time-of-Flight Mass-Spectrometry (MALDI-TOF MS) assay. Antibiotic sensitivity testing was put up for the microorganism by Kirby-Bauer disc diffusion method on Muller-Hinton agar with 5% sheep blood culture media using a selected set of antibiotics, according to the Clinical and Laboratory Standards Institute (CLSI) 2019 guidelines [1]. The isolate was sensitive to daptomycin, minocycline, and linezolid. Eleven days after her admission to the facility, her condition deteriorated and she developed respiratory distress with an oxygen saturation of

Laboratory parameters	Normal reference values	Day 0	Day 7	Day 14
Total leuckocytes count (cells/cubic mm)	4,000 to 11,000 cells/cubic mm	20,900 cells/cubic mm	30,200 cells/cubic mm	34.400 cells/cubic mm
D-dimer (Quantitative assay)	<0.5 µg/mL	0.7601 µg/mL	5.963 µg/mL	4.93 µg/mL
Procalcitonin by chemilumi-nescence	<0.1 ng/mL	0.06 ng/mL	0.08 ng/mL	0.26 ng/mL
C-reactive protein (Turbilatex)	<6 mg/L	0.239 mg/L	0.092 mg/L	0.066 mg/L
Serum ferritin	20 to 300 ng/mL	1228 ng/mL	956 ng/mL	572 ng/mL
Fibrinogen Degradation Products (FDP)- latex agglutination method	Latex agglutination tests are only used to identify the presence of the FDP in patients' plasma	Positive	Positive	Positive

[Table/Fig-1]: The laboratory tests performance on day 0, day 7, and day 14 of admission.

72%. She was intubated and shifted on mechanical ventilation in the intensive care unit. She had an episode of hypotension and was started on inotropes but her ionotropic support requirement increased and she went into respiratory distress. Two days later she developed an episode of asystole and she could not be revived.

[Table/Fig-2]: Direct smear prepared from positively flagged blood culture bottles showing Gram-positive cocci in chains and clusters (Gram-positive 100x).
[Table/Fig-3]: Blood culture plate showing growth of *Aerococcus viridans* with alpha hemolysis represented by green discoloration of the media. (Images from left to right)

DISCUSSION

These microorganisms with colonies and characteristics similar to *Aerococcus viridans*, streptococci are rare Grams positive microorganism called Aerococci. These microorganisms are identified largely as environmental or skin contaminants. The use of Matrix-Assisted Laser Desorption Ionization Time-of-Flight Mass-Spectrometry (MALDI-TOF MS), a unique technique of microorganism identification, has identified Aerococci as a significant human pathogen capable of causing a diverse range of infections [2]. Commonly known species of Aerococci are, *Aerococcus viridans, Aerococcus sanguinicola*, and *Aerococcus urine* [3]. Aerococci can be pathogenic to immunosuppressed patients. Although the risk factors for their role as a pathogenic microorganism are not fully known, an increase in length of hospital stay, previous exposure to broad-spectrum antibiotics, surgical procedures, and foreign bodies like implants and artificial heart valves have been implicated in the risk factors for developing systemic infections caused by *Aerococcus viridans* [4]. In light of the COVID-19 pandemic, prolonged hospitalisation, rigorous use of steroids, and immunosuppressed state of the patient have led to an increase in the incidence of secondary bacterial infections caused by rare and opportunistic pathogens.

In the present case report, a 48-year old female, known case of bronchial asthma suffering from COVID-19 developed respiratory distress needing mechanical ventilation. She was immunosuppressed due to the viral infection that caused damage to the respiratory epithelial cells and steroid therapy which made her susceptible to rare and opportunistic infections. The hospital environment harbors opportunistic microorganisms known to be multidrug-resistant and causing infections like bacteraemia, endocarditis, and urinary tract infection [5]. In a study by Sierra-Hoffmann M et al., a correlation between urinary tract infections and bacteraemia was seldom noted in cases of elderly women in contrast to the present case report whose urine culture was sterile [6].

Recommendations on antibiotic sensitivity testing and sensitivity interpretations have been released by the Clinical and Laboratory Standards Institute (CLSI) and the European Committee on Antimicrobial Susceptibility Testing have released (EUCAST) for Aerococcus species [7-10]. The isolate was subjected to antibiotic sensitivity testing by Kirby-Bauer disc diffusion method. The measurement of zones of inhibition for each antibiotic against each isolate was measured and classified as sensitive, intermediate, and resistant according to the tables and guidelines by CLSI 2019 [1]. The isolate was sensitive to daptomycin, minocycline, and linezolid and resistant to amoxicillin, ampicillin, doxycycline, gentamicin, levofloxacin, vancomycin and teicoplanin. Most pathogenic infections by Aerococcus species isolates respond to treatment by carbapenems and penicillin, higher MICs are observed for cephalosporins, in contrast with our case report where the isolate was penicillin-resistant. Resistance to clindamycin, ciprofloxacin, cotrimoxazole, gentamicin, and tetracycline has been observed among Aerococcus isolates [8,10-13]. Reports of resistance to vancomycin and penicillin have been reported earlier in studies by Shelton-Dodge K et al., Skov R et al., Christensen JJ et al., Lupo A et al., and Varshini K et al., which correlates with the antibiotic resistance pattern in the present study [9-12,14]. There is a lack of literature on antibiotic susceptibility pattern among cases of *Aerococcus viridans* bacteraemia in COVID-19 patients. As it is an opportunistic and more commonly a nosocomial infection, the antibiotics should be administered according to antibiotic susceptibility testing to prevent delay in appropriate antibiotic therapy owing to multidrug resistance [2]. Isolation of such hospital pathogens emphasises use of automated methods of bacterial identification that help us identify these rare pathogens and formulate appropriate guidelines for antibiotic therapy [14]. This case study emphasises the importance of MALDI-TOF-MS assay which has helped in giving direction to treatment in cases not responding to empirical antimicrobials. Although studies conducted by Castaldi S et al., [15] and Moudgil N et al., [16] both reported *Aerococcus viridans* as one of the causative pathogens of hospital acquired infections in COVID-19 patients, still no other data about the clinical outcome of the patient was discussed. To authors best knowledge this is the first case report that describes *Aerococcus viridans* bacteraemia in a COVID-19 patient.

CONCLUSION(S)

The use of MALDI-TOF MS has helped us recognise Aerococcus as a human pathogen capable of causing a variety of infections. The antibiotic sensitivity testing and knowledge of newer antibacterial agents will facilitate in swiftly combating overt bacteraemia and sepsis in immunocompromised patients.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jul 06, 2022
- Manual Googling: Aug 15, 2022
- iThenticate Software: Aug 18, 2022 (5%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jul 05, 2022**
Date of Peer Review: **Jul 27, 2022**
Date of Acceptance: **Aug 25, 2022**
Date of Publishing: **Nov 01, 2022**