Microbes and Infectious Diseases 2026; 6(4): 6341-6346

Microbes and Infectious Diseases

Journal homepage: https://mid.journals.ekb.eg/

Short report

An unusual case of *Streptococcus cristatus* infection in a patient with decompensated liver disease

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ARTICLE INFO

Article history:
Received10 August2024
Received in revised
form2September2024
Accepted5September2024

Keywords:
Antimicrobial susceptibility
Ascitic fluid
Infections
Liver Disease
Streptococcus.

ABSTRACT

Cases of infections caused by *Streptococcus cristatus*, a member of the Mitis group within the *Streptococcus* genus and an important component of the oral microbiota, are quite rare. This study presents the first documented case of *S. cristatus* found in the ascitic fluid of a patient with decompensated liver disease.**Methods**: Ascitic fluid samples collected aseptically were inoculated into Brain Heart Infusion (BHI) broth (HiMedia, Mumbai, India) and incubated overnight at 35°C-37°C under optimal atmospheric conditions. After overnight incubation, the broth sample was then cultured on 5% sheep blood agar (HiMedia, Mumbai, India) and MacConkey agar plates (HiMedia, Mumbai, India) and incubated at 37°C for 18-24 hours.**Results**: Gram staining of the ascitic fluid sample revealed a few gram-positive cocci in pairs and chains. Significant growth of alpha-hemolytic colonies was observed and identified as *Streptococcus cristatus*using automated bacterial identification systems. **Conclusion**: Antimicrobial treatment was not initiated because the patient's family chose to forgo further clinical management. Effective treatment generally requires accurate identification of the bacterial isolate, appropriate and careful use of antibiotics, and patient education on the importance of oral hygiene.

Introduction

Streptococcus cristatus (*S. cristatus*), part of the Mitis group within the *Streptococcus* genus, is described as "Gram-positive, catalase-negative cocci that are approximately 1 μm in diameter and grow in chains." Like many *Streptococcus* species, *S. cristatus* is a commensal bacterium in the human oral cavity [1,2], that also plays a crucial role in maintaining the oral microbiota, as various studies have demonstrated its antagonizing effect on *Streptococcus mutans*, a cariogenic microorganism considered a risk factor for cancer and tumor progression [3]. New phenetic tests and DNA–DNA hybridization experiments have reliably distinguished this species from other closely related streptococci [1]. To date, very few cases of infections caused by these bacteria have been reported, primarily involving endocarditis, septic arthritis in the wrist, postoperative endophthalmitis, community-acquired pneumonia, and vertebral osteomyelitis [4]. However, its pathogenicity in cases of decompensated liver diseases, also known as decompensated cirrhosis, is less well understood.

This study aims to describe a case of *S. cristatus*isolated from the ascitic fluid of a patient with decompensated liver disease. Our case represents the first reported instance of *S. cristatus*isolated from an ascitic fluid sample [4,5]. Given that infection is a cause of hepatic

DOI:110.21608/MID.2024.311215.2146
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decompensation in cirrhosis, leading to prolonged hospital stays and even in-hospital deaths, it is crucial to determine the underlying cause of hepatic decompensation through thorough history, examination, and investigations so that appropriate treatment can be provided [6].

Case Presentation

A 56-year-old man with a history of decompensated chronic liver disease, classified to a Model for End-stage Liver Disease (MELD-Na) score of 31 and a Class C Child–Pugh Score, was admitted to the hospital with complaints of abdominal distension and bilateral lower limb swelling for the past five days, along with decreased urine output for the past two days. On further clinical evaluation, blood tests had revealed deranged liver and renal function tests, as shown in **Table 1**.

On the day of the admission, the total leucocyte count (TLC) was noted to be 11,310 cells/mm^3 (*Reference range: 4,000 – 10,000 cells/mm*^{3}). The differential leucocyte count (DLC) showed Neutrophils at 75.1% and Lymphocytes at 16.4% (reference range: Neutrophils 40-80%, Lymphocytes 20-40%), and the Erythrocyte Sedimentation Rate (ESR) was 20 mm/hr (reference range: 0–14 mm/hr). Serial monitoring of hemoglobin levels indicated a downward trend (**Table 1**). A peripheral smear revealed dimorphic anemia with lymphopenia and thrombocytopenia. Due to melena, the patient underwent an upper gastrointestinal (GI) endoscopy, which showed signs of residual esophageal varices and mild portal hypertensive gastropathy.

Abdominal paracentesis was performed under strict aseptic precautions due to significant ascites and abdominal discomfort. A sample of ascitic fluid was sent for cytological evaluation and microbiological culture and sensitivity testing.

Microbiological Analysis

Ascitic fluid samples collected aseptically were inoculated into Brain Heart Infusion (BHI) broth (HiMedia, Mumbai, India) and incubated overnight at 35°C-37°C under optimal atmospheric conditions. Gram staining of the ascitic fluid sample revealed a few gram-positive cocci in pairs and chains, along with moderate leukocytes. After overnight incubation, the BHI broth showed turbidity. The broth sample was then cultured on 5% sheep blood agar and MacConkey agar plates (HiMedia, Mumbai, India) and incubated at 37°C for 18-24 hours.

High growth of small (0.5 mm - 1 mm) alpha-hemolytic colonies was observed on the 5% sheep blood agar(HiMedia, Mumbai, India) using the streak plate isolation method [**Figure 1**], while no growth was seen on the MacConkey agar(HiMedia, Mumbai, India). Gram staining of the isolated colonies revealed gram-positive cocci in chains [**Figure 2**]. The catalase test was negative. The bacteria were identified as *Streptococcus cristatus* with 99% probability by the VITEK 2 Compact System (BioMérieux, Marcy L'Etoile, France) automatic identification system (using the gram-positive identification card) and the matrix-assisted laser desorption/ionization-time of flight (MALDI-ToF) based automated bacterial identification system (bioMérieux, France).

Susceptibility cards were inoculated and interpreted according to the manufacturer's instructions, following the Clinical and Laboratory Standards Institute standard protocol recommendations for media and antibiotic breakpoints [7]. The antibiotic susceptibility pattern of the isolated bacteria is displayed in **Table 2**.

Outcome

The patient was managed conservatively with hepatoprotective and other supportive measures. However, due to financial constraints, the patient's family declined further clinical management. Consequently, antimicrobial medications were not initiated, and the patient was discharged against medical advice after a 5-day hospital stay.

Table 1. Patient's laboratory data on admission.

Parameters	**Observed Value**	**Reference Range**
Haemoglobin	Admission day: 8.8 gm/dl 2nd day: 7.9 gm/dl	13.0 – 17.0 gm/dl
Total Protein	5.8 g/dl	6.3-8.3g/dL (Adults)
A/G Ratio	0.56	1.0-2.1
Total Bilirubin	3.11 mg/dL	0.2 - 1.3 mg/dL
Direct Bilirubin	1.32 mg/dL	0.0 – 0.4 mg/dL
Indirect Bilirubin	1.79 mg/dL	0.0 – 0.75 mg/dL
Serum Glutamic-Oxaloacetic Transaminase (SGOT)	43.0 U/L	5.0 – 30.00 U/L
Serum Glutamate Pyruvate Transaminase (SGPT)	40.0 U/L	4.0 – 36.00 U/L
Alkaline Phosphatase	135.0 U/L	38.0 – 126.00 U/L
Sodium	127.0 mmol/l	136.0 – 145.0
Creatinine	1.9 mg/dl	0.7 - 1.4 mg/dl
Cytopathological Report – Ascitic sample	Cell count - 42 cells / cumm. Differential Counts - Lymphocytes: 76% Reactive mesothelial cells: 12% Neutrophils: 12%. Smears showed reactive mesothelial cells in small clusters, lymphocytes and few neutrophils against proteinaceous background.	

Table 2. Antibiotic susceptibility pattern of the isolate.

Antibiotic	**MIC*(µg/mL)**	**Result**
Benzylpenicillin	0.25	Intermediate
Ampicillin	<=0.25	Sensitive
Cefotaxime	<=0.12	Sensitive
Ceftriaxone	<=0.12	Sensitive
Levofloxacin	>=16	Resistant
Moxifloxacin	1	Sensitive
Erythromycin	2	Resistant
Clindamycin	<=0.25	Sensitive
Linezolid	<=2	Sensitive
Vancomycin	0.5	Sensitive
Tetracycline	>=16	Resistant

*MIC- Minimal Inhibitory concentration

**The aforementioned bacterial isolate were resistant to Levofloxacin, Erythromycin and Tetracycline.

Figure 1. Alpha-hemolytic colonies as observed on the 5% sheep blood agar (HiMedia, Mumbai, India) using the streak plate isolation method.

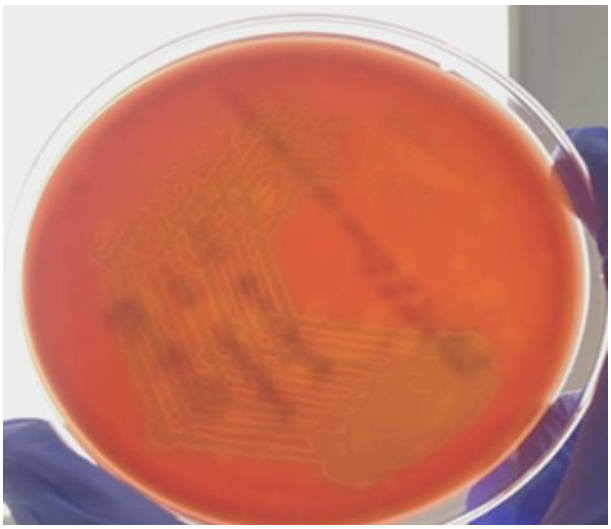
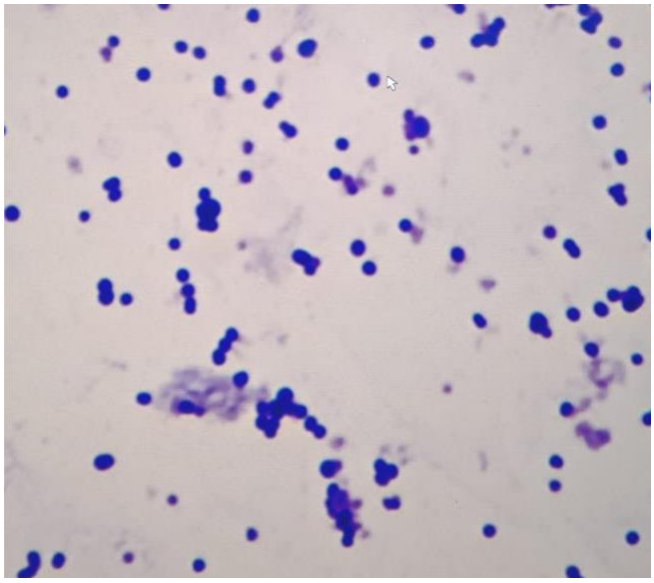


Figure 2. Gram staining of the isolated colonies, as observed under 100X oil immersion, revealed gram-positive cocci in chains.



Discussion

S. cristatus is predominantly found on the mucosal surfaces of the oral cavity. However, there is limited understanding of its pathogenic potential. The phenotypic identification of viridans streptococci at the species level relies on colony morphology, growth patterns, and biochemical reactions, which suggests that infections involving *S. cristatus* may be underreported, particularly in polymicrobial infections. To date, only 13 clinical cases involving this microorganism have been documented in the literature, with nearly half of these cases associated with infective endocarditis [8]. However, the presence of additional microorganisms in some of these cases introduces uncertainty regarding the true pathogenicity of *S. cristatus* [4]. Most of the patients had underlying health conditions and/or poor dental hygiene [8], unlike our patient.

In most of the previously mentioned cases, the diagnosis was established through bacterial culture [8]. Microbiological cultures are regarded as

the gold standard for identifying pathogenic bacteria. However, the sensitivity of these cultures varies significantly depending on the context of sample collection and the pathogen involved [9]. The failure to accurately identify *S. cristatus* can lead to several issues. Firstly, there is a risk of treatment failure if an ineffective antibiotic is selected. Secondly, the use of unnecessarily broad-spectrum antibiotics for an extended period increases the risk of toxicity and contributes to the development of antibiotic resistance [8].

Molecular assays for infectious diseases have become an important tool in clinical decision-making by detecting pathogens that conventional methods may miss. Several studies have shown that a universal PCR approach targeting bacterial 16S rRNA can significantly improve diagnostic accuracy. However, some researchers have pointed out its lack of specificity, noting that contamination can lead to false-positive results since even trace amounts of DNA can be amplified. Therefore, they recommend that this method be primarily reserved for culture-negative cases when an infection is suspected [8,10].

The selection of empirical antibiotic therapy should consider local resistance patterns, the patient's medical history, clinical presentation, and the suspected portal of entry [8]. Effective treatment typically involves antibiotics and patient education on the importance of oral hygiene, both of which are crucial for successful management and a favorable discharge without infection recurrence [4].

Conclusion

This case represents the first reported instance of *S. cristatus* being isolated from ascitic fluid in a patient with decompensated chronic liver disease, a bacterium typically regarded as part of the commensal oral mucosa microbiota. Our case report underscores the critical role of appropriate sample collection, bacteriological cultures and automated bacterial identification system in identifying the causative organism and guiding appropriate antibiotic therapy.

Funding

No external funding was received for this study.

Conflict of interest

The authors declare that there is no conflict of interest.

Data availability

All data generated or analyzed during this study are included in this puplished article.

Authors' contribution

All authors made significant contributions to the work presented, in the study design, implementation, data collection, analysis, and interpretation. They also contributed to the article's writing, revising, or critical evaluation, gave final approval for the version to be published.

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