Case Report

Bacteraemia due to *Staphylococcus pseudintermedius* in a bone marrow transplant recipient - A Case Report

RadhaRani D, Rakesh P, Sravanthi CH, Swathi N, Senthil Rajappa J

Sri Lankan Journal of Infectious Diseases 2025Vol.15(2):88:1-6

DOI: https://doi.org/10.4038/sljid.v15i2.8762

Abstract :

Staphylococcus pseudintermedius commonly colonises the mucosal surfaces of animals, especially dogs. It is an opportunistic zoonotic pathogen which can colonise humans and cause severe infections in immunocompromised hosts. Methicillin-resistant *S. pseudintermedius* (MRSP) has gained public health importance in recent years. We report a case of an 18-year-old female with Hodgkin's lymphoma who underwent autologous transplant and developed fever spikes on the 6th day post stem cell infusion. The isolate from blood culture was identified by Vitek 2 compact system as *S. pseudintermedius*. The patient gave a history of exposure to a pet dog, which had died just prior to her admission to the transplant unit. When clinicians encounter isolates that are unusual or uncommon, it is important to consider potential sources of exposure, including animal exposures.

Keywords *: Bacteraemia, Bone marrow transplantation, Staphylococcus, Methicillin resistance*

Introduction:

Staphylococcus pseudintermedius was first described in 2005 and included in the *S intermedius* group (SIG).Other members of the SIG group include *S. delphini, S. intermedius, S. cornubiensis* and *S. ursi.* They commonly colonise the mucosal surfaces of animals, especially dogs. The prevalence of human colonisation with this organism is not known as it is usually misidentified as *Staphylococcus aureus*. However, humans may be transiently colonised with *S. pseudintermedius.* This organism is associated with urinary tract infections and otitis in dogs and is also a frequent cause of skin and soft tissue infections (SSTI) in animals. In humans SSTIs remain the most prevalent clinical manifestation of infection caused by this organism. Sino-nasal infections, bacteraemia and infections related to implantations have also been reported in humans

S. pseudintermedius can form biofilms. Virulence factors including cytotoxins, exfoliative toxins, superantigens and cell wall–associated (CWA) proteins are responsible for evading the immune system and initiating infections including SSTI's.[1] In contrast to *Staphylococcus aureus*

Basavatarakam indo American cancer hospital, India

Address for correspondence: Dr. D.RadhaRani, Basavatarakam indo American Cancer Hospital, India. Tel:9949726555 Email: dradharani@gmail.com https://orcid.org/0000-0002-8261-1467

Received 20 November 2024 and revised version accepted 31 March 2025. Published on 8 September 2025

which can colonise 14% of dogs and 20% of cats, *S. pseudintermedius* can colonise up to 68% of dogs and 22% of cats.[2]

We report a case of a bloodstream infection caused by *S pseudintermedius* in a patient who underwent a bone marrow transplant, who may have acquired the infection from her pet dog.

Case presentation:

A 20-year-old female was previously treated for Hodgkin's lymphoma (early favorable) with 4 sessions of combination chemotherapy which was completed in June 2023. On routine follow-up in December 2023, she complained of chest heaviness and intermittent cough. Re-evaluation with imaging and biopsy confirmed a relapse. She received combination chemo-immunotherapy as salvage therapy with Keytruda®, Gemcitabine, Vinorelbine and Doxorubicin protocol. Post two sessions of salvage therapy she attained a complete metabolic and morphological response. Post remission, in March 2024, she was planned for consolidation with autologous transplant with BEAM (Bendamustine/Etoposide/Cytarabine/Melphalan)conditioning. Anti-microbial prophylaxis with ciprofloxacin, acyclovir and posaconazole were initiated post completion of conditioning. Cryopreserved stem cells were given post conditioning on 22nd March 2024.

On the 6th post stem cell infusion day , the patient developed high grade fever. Complete blood picture revealed neutropaenia (WBC counts 0.03 x10^9/l) and thrombocytopaenia (27 x10^9/l). A thorough clinical evaluation did not reveal any specific focus of infection. Suspecting blood stream infection (BSI), after drawing blood for culture from both lumens of the Hickman® catheter and a peripheral vein , the patient was started on broad spectrum empirical antibiotics as shown in Table 1.

Table 1. Schedule of antibiotic use

Antibiotic	Start date	Stop date	Duration
Cefoperazone/Sulbactam	28/03/2024	29/03/2024	1day
Teicoplanin	28/03/2024	31/03/2024	4 days
Amikacin	28/03/2024	01/04/2024	5days
Meropenem	29/03/2024	02/04/2024	5days
Linezolid	29/03/2024	03/04/2024	6 days
Co-amoxyclav	04/4/2024	08/04/2024	5 days

Anaerobic and aerobic blood culture bottles were inoculated with 10 mL of blood and cultured in the BacT/Alert® automated system. Blood cultures signaled positive in twelve hours from both lumens of the Hickman's catheter. Subculture on 5% sheep blood agar (Biomerieux) grew yellow pigmented β haemolytic colonies resembling *S. aureus* (Figure1). Phenotypic identification of *S. pseudintermedius* and its differentiation from *S. aureus* are given in Table 2

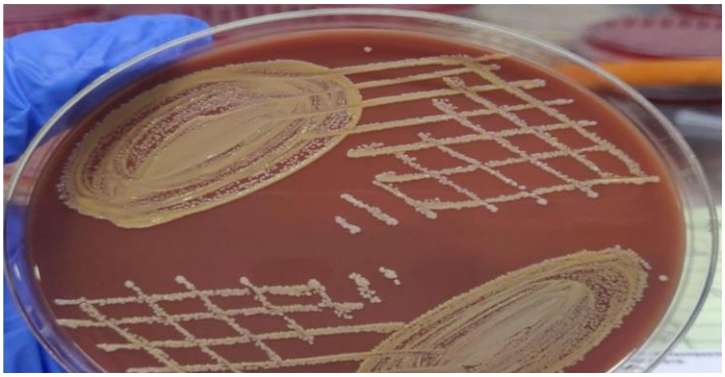

Figure 1
***S. pseudintermedius* on 5% sheep blood agar**

Table 2 S. pseudintermedius and its differentiation from *S. aureus*[3]

Characteristics	*S. pseudintermedius*	*S. aureus*
Clumping factor	-	+
PYR(Pyrrodinyl acryl amidase)	+	-
β-Galactosidase	+	-
Mannitol fermentation	-	+
Acetoin production	-	+
Polymyxin B susceptibility	Susceptible	Resistant
Hyaluronidase	-	+

Table.3
Antibiotic susceptibility pattern

Antibiotics	MIC	Interpretation
Oxacillin	≤ 0.25	sensitive
Gentamicin	≤ 0.5	sensitive
Vancomycin	≤0.5	sensitive
Teicoplanin	≤ 0.5	sensitive
Linezolid	= 2	sensitive
Clindamycin	=0.25	resistant
Erythromycin	≥8	resistant
Ciprofloxacin	≥8	resistant
Levofloxacin	≥4	resistant
Cefoxitin screen		negative
Inducible clindamycin		positive

The isolates were catalase and tube coagulase positive by standard methods and identification and sensitivity testing was done using VITEK-2. The isolates were identified as *S. pseudintermedius* with 98% probability. Antibiotic susceptibility of the isolate is given in Table 3.

In view of persistent high-grade fever and ongoing diarrhoea, antibiotics were modified while awaiting the culture results, with additional Gram-negative cover by substitution of cefoperazone-sulbactam with meropenem.

Once preliminary results suggested septicaemia with Gram positive organisms, linezolid was added during the course of therapy. She responded favorably, with defervescence of fever on the 9th post stem cell infusion day. Antibiotics were further de-escalated to co-amoxyclav 625mg. Posaconazole prophylaxis was withheld on the 11th post stem cell infusion day.

She continued to have low quantity frequent stools, which were managed with oral probiotics and anti-motility medications. She was able to tolerate an oral diet, and abdominal discomfort was better with the above management. With overall improvement in her general condition, she was discharged on the 14th post stem cell infusion day in good clinical condition.

The timeline of the patient's progress is given below (Figure 2).

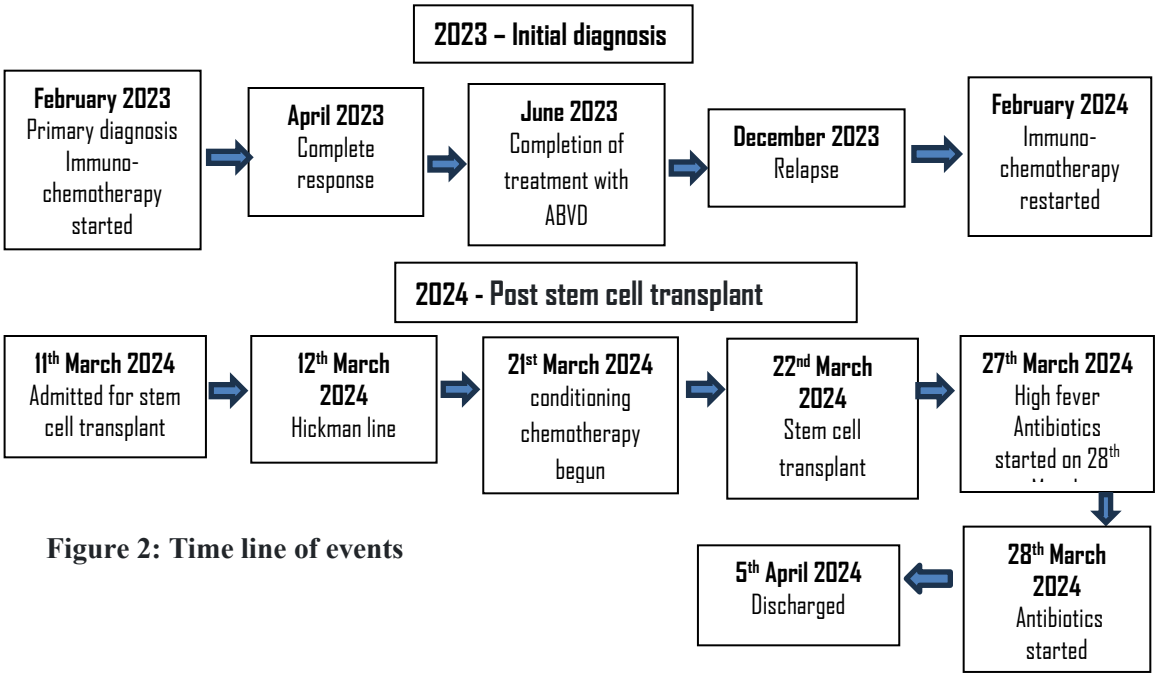

Figure 2: Time line of events

Discussion:

Staphylococcus pseudintermedius is a Gram-positive coccus in clusters, catalase positive and tube coagulase positive like *S aureus* and may be misidentified as *S aureus* due to similar colony morphology. Most automated identification systems correctly identify *S intermedius* group with 96-98% probability (Vitek2) and excellent correlation with other molecular techniques.[4] MALDI-TOF MS (Vitek MS, Biomereux) can differentiate between *S. aureus* and *S. intermedius* group but cannot differentiate between *S. intermedius* and S. *pseudintermedius.* Other advanced technologies such as DNA sequencing techniques (multilocus sequence typing and whole genome sequencing PCR amplification of species-specific genes such as the thermonuclease (nuc) gene) are useful in identifying and differentiating *S. pseudintermedius* from *S. aureus.*[3]

S pseudintermedius is a common coloniser of dogs and had been implicated as a cause of pyoderma in dogs. In companion animals, the most common site of colonisation of *S. pseudintermedius* is the pharynx and rectum.[5]*S. pseudintermedius,* similar to *S. aureus* colonises the human nares.[5,6] The first human infection with this pathogen was reported by Van Hoovels et al (2006) from a 60-year-old patient with clinical presentation of ventricular tachycardia and ischemic cardiomyopathy.[7]

There are a few studies on *S pseudintermedius* causing human infections. Somayaji et al. (2016)[6] analysed 27 isolates of *S. pseudintermedius* from 24 patients. Skin and soft tissue infection was present in eighteen patients (75.0%), invasive infections due to prosthetic joints and blood stream infection were reported in two (8.3%) and colonisation was present in 4 (16.7%). Contact with dogs was reported in 22 (92.1%) patients. *S. pseudintermedius* infection was also described in a bone marrow transplant recipient.[8] The first case of central line associated blood stream infection (CLABSI) with this organism was reported by Chuang et al (2020) in a haemophilic child.[9]

Due to the possibility of zoonotic transmission, our patient on further questioning gave a history of exposure to her pet dog which had died. Just prior to admission to the transplant unit she had participated in the burial of the dog.A Hickman's catheter was inserted on March 12th 2024 prior to isolation of this organism from bloodculture.The patient may have been colonised with *S. pseudintermedius* likely transmitted from her pet dog,with subsequent contamination of the Hickman line potentially serving as the source of bacteraemia.

Due to the emergence of methicillin-resistance, S. pse*udintermedius* (MRSP) is gaining attention in recent years. These strains are intrinsically resistant to beta–lactam and other non-beta- lactam antimicrobials including sulfonamides, fluroquinolones, lincosamides, macrolides and tetracyclines. While there are several reports on antibiotic resistant *S. pseudintermedius* recovered from dogs, very few reports exist in the literature on human MRSP.[10] In a study conducted by Somayaji et al (2016)[6], methicillin resistance in human isolates was seen in 22.2% of cases. As the patient had persistent fever spikes with profound neutropaenia, she was started on oral linezolid (600mg twice daily) and continued on the same although the isolate was reported subsequently as sensitive to methicillin. She responded favorably, with defervescence of fever on 9th day post stem cell infusion. Antibiotics were further de-escalated to amoxyclav with overall improvement in her general condition. Repeat blood cultures were negative, and the patient was discharged on 14th day post stem cell infusion in good clinical condition.

With difficulties in accurate diagnosis, the true prevalence and incidence of *S. pseudintermedius* as coloniser and as a pathogen remains unclear. Further studies are also warranted to understand zoonotic transmission dynamics of *S. pseudintermedius*, as a direct transmission link between household pets and humans had not been conclusively confirmed.

Conclusion:

S. pseudintermedius, an emerging zoonotic pathogen, colonises and infects animals. It has the potential to cause life threatening infections due to its virulence factors and drug resistance genes. When such isolates are encountered, clinicians should acquire a history of contact with pets. Awareness of this pathogen among healthcare providers and veterinarians is needed to educate especially immunocompromised patients to prevent transmission of this disease from pets.It is also necessary to have a thorough review of potential exposures to zoonotic organisms among patients planned for stem cell transplant therapy.

Declaration

Conflict of interest: None.
Acknowledgements: None
Funding source: Nil
Ethics Statement: Patients consent was obtained
Author contributions: All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Dr. Radha Rani and Dr. Rakesh Pinninti. The first draft of the manuscript was written by Dr. Radha Rani and Dr. Rakesh Pinninti and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript

References:

1. Carroll KC, Burnham C-AD, Westblade LF et al. From canines to humans: Clinical importance of Staphylococcus pseudintermedius. *PLoSPathog*, 2021; 17(12):e1009961. *doi: https://doi.org/ 10.1371/journal.ppat.1009961*.
2. Lainhart W, Yarbrough ML, Burnham C-AD et al. The Brief Case: *Staphylococcus intermedius* group—look what the dog dragged in. *J Clin Microbiol* ,2018; 56(2):e00839-17. *doi: https://doi.org/10.1128/JCM.00839-17*
3. Moses, I.B.; Santos, F.F.; Gales, A.C. Human Colonization and Infection by *Staphylococcus pseudintermedius*: An Emerging and Underestimated Zoonotic Pathogen. *Microorganisms* 2023; *11(3)*:581. *doi: https://doi.org/10.3390/microorganisms11030581*
4. Marathe AP, Vasava H, Mehta V et al. . Case report: Staphylococcus pseudintermedius causing cryptogenic Liver abscess in a previously healthy pediatric patient. IP *Int J Med Microbiol Trop Dis* 2024;10(1):79 -83 *doi: https://doi.org/ 10.18231/j.ijmmtd.2024.015*
5. Rubin JE, Chirino-Trejo M. Prevalence, Sites of Colonization, and Antimicrobial Resistance Among Staphylococcus Pseudintermedius Isolated from Healthy Dogs in Saskatoon, Canada. *Journal of Veterinary Diagnostic Investigation*. 2011; 23(2):351-354 *doi:10.1177/104063871102300227*
6. Somayaji R, Priyantha MA, Rubin JE et al. Human infections due to Staphylococcus pseudintermedius, an emerging zoonosis of canine origin: report of 24 cases. *Diagn Microbiol Infect Dis.* 2016; 85(4):471-476 *doi: 10.1016/j.diagmicrobio.2016.05.008*
7. Van Hoovels L, Vankeerberghen A, Boel A, et al.. First case of Staphylococcus pseudintermedius infection in a human. *J Clin* Microbiol. 2006; 44(12):4609 – 4612 *doi: 10.1128/JCM.01308-06*.
8. Savini V, Barbarini D, Polakowska K,et al. Methicillin-resistant Staphylococcus pseudintermedius infection in a bone marrow transplant recipient. *J Clin Microbiol*. 2013;51(5):1636-1638 *doi: 10.1128/JCM.03310-12*
9. Chuang CY, Yang YL, Hsueh PR et al. Catheter-related bacteremia caused by Staphylococcus pseudintermedius refractory to antibiotic-lock therapy in a hemophilic child with dog exposure. *J Clin Microbiol*. 2010; 48(4):1497-8. *doi: 10.1128/JCM.02033-09*
10. Paul NC, Moodley A, Ghibaudo G, et al. Carriage of methicillin-resistant Staphylococcus pseudintermedius in small animal veterinarians: indirect evidence of zoonotic transmission. *Zoonoses Public Health*. 2011;58(8):533-9. *doi: 10.1111/j.1863-2378.2011.01398*.