Contaminant to Clinically Significant: A Case of *Staphylococcus Haemolyticus* Central Line Associated Blood Stream Infection Unveiled

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ABSTRACT

In this case study, a 57-year-old diabetic patient was admitted to the intensive care unit (ICU) in a general hospital in Southwest Saudia Arabia following a road traffic accident (RTA). He subsequently developed a Central Line Associated Blood Stream Infection (CLABSI) with *Staphylococcus haemolyticus* (*S. haemolyticus*). Despite his fever and elevated inflammatory markers, the organism was initially dismissed as a contaminant, leading to delayed diagnosis and inadequate treatment with different antibiotics. Empirical antibiotic therapy was ineffective, prompting a change to Vancomycin following organism identification and a full susceptibility report. Communication gaps between the laboratory and clinicians, combined with the lack of rapid organism identification tools, contributed to the delay in appropriate therapy. The active surveillance of the infection control department facilitated the identification of recurring infections, leading to timely intervention and a positive outcome for the patient. This case underscores the importance of prompt and accurate organism identification, effective communication between laboratory staff and clinicians, and the proactive role of infection control doctors in detecting and managing healthcare-associated infections to ensure optimal patient care.

Key words: Central Line Associated Blood Stream Infection, *Staphylococcus haemolyticus*, Infection Control Doctors, Intensive Care Unit

INTRODUCTION

Staphylococcus haemolyticus (*S. haemolyticus*) is part of Coagulase-negative staphylococci (CNS) and a prominent component of the human skin microbiota [1]. It is usually considered a skin contaminant. However, it can be a significant pathogen responsible for healthcare-associated infections [2]. In fact, this species accounts for 10–20% of clinical CNS infections [3]. Notably, strains of *S. haemolyticus* implicated in these infections exhibit higher levels of antibiotic resistance compared to other coagulase-negative Staphylococci. A distinguishing characteristic of pathogenic strains of *S. haemolyticus* is their capacity to form biofilms, a factor implicated in the etiology of catheter-associated infections [4]. Severe clinical manifestations associated with *S. haemolyticus* infections include meningitis, endocarditis, prosthetic joint infections, septicemia, and a range of other conditions, particularly observed in immunocompromised patients [5]. The aim of this report is to investigate a case of Central Line Associated Blood Stream Infection (CLABSI) with *S. haemolyticus*, which was considered insignificant and misdiagnosed as a result of lack of communication between the main lab and the ICU.

CASE PRESENTATION

A 57-year-old diabetic man was admitted to the Intensive Care unit (ICU) through the Emergency Room (ER) in a general hospital, Southwest Saudi Arabia as a result of a road traffic accident (RTA). On admission, he was suffering from minor head trauma and multiple fractured ribs. In ER, a central line was inserted on a rush before his transferal to ICU and a urinary catheter was also inserted afterward in ICU. The patient was stable and managed according to hospital protocol. Four days later, the patient became febrile (39ºC) and his blood work showed high C Reactive Protein (CRP) > 11mg/L, Leukocytosis 27x10⁹/L and neutrophilia 20x10⁹/L. Septic screening was done to the patient and all his cultures came back negative, except for his blood cultures which had CNS.

In the laboratory, no further investigation was conducted, and the bench technician noted: "CNS possibility contaminant, please send another sample." Nevertheless, the patient was managed empirically receiving Cefuroxime (1.5 g IV/8hr) in combination with Gentamicin (1 mg/kg IV/8hr). Despite this treatment regimen, the patient continued to experience fever, with temperature reaching 40ºC, necessitating management with Acetaminophen and cooling blankets. Subsequently, a new set of blood cultures was obtained, and 72 hours later, the culture yielded positive results for CNS. In response, the patient's antibiotic therapy was modified to Imipenem (1 g IV/6hr), yet the patient continued to exhibit febrile episodes coinciding with the waning effect of Acetaminophen.

As part of the daily responsibilities of the infection control department, all positive cultures within the hospital undergo monitoring and review by the infection control consultant as

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part of the daily surveillance for healthcare-associated infections (HAI). The consultant observed a recurring pattern of positive results for *Coagulase-negative staphylococci* in the hospital setting. As such, a request was made to the laboratory for full organism identification and sensitivity testing, which is usually conducted phenotypically using the VITEK 2 lab automated diagnostic system for microbial identification and antibiotic susceptibility testing (bioMérieux). The identified organism was *S. haemolyticus*, which demonstrated sensitivity solely to Co-trimoxazole, Erythromycin, Amikacin, and Vancomycin. Accordingly, a suggestion was made to the treating ICU physician to remove the central line and replace the current imipenem treatment with Vancomycin. The ICU doctor accepted the suggestion, and the patient was put on vancomycin (1 gram q/12hr). Within 24 hours, the patient showed improvement and was subsequently transferred to a general ward several days later. The patient was then discharged from the hospital after 28 days, having recovered in good health.

DISCUSSION

This case report highlights the challenges faced by ICU clinicians in managing patients with infection, particularly in the context of healthcare-associated infections (HAI). The patient, in this case, suffered from multiple trauma and developed a central line-related bloodstream infection (CLABSI). CLABSI is identified as a confirmed bloodstream infection detected in a laboratory that occur within 48 hours of the insertion of the central line and is not associated with an infection from another location in the body (Haddadian et al., 2022) [6]. This infection most probably have been triggered by the central line insertion [7], or urinary catheter [8], especially since both were inserted in a rush of which the central line was inserted in the ER. Moreover, the nature of the organism may indicate it is a skin organism [9]. CNS can be found on the skin innocently but can be involved in severe infection if it reaches the blood stream. A fairly recent report shows this [10]. Upon admission to the ER, the patient's life was saved, possibly causing healthcare professionals to inadvertently lapse in adhering to aseptic techniques. Therefore, CLABSI bundles were not applied as they should be. CLABSI bundles consist of practices such as performing hand hygiene before inserting or manipulating catheters, utilizing chlorhexidine-alcohol for site preparation and maintenance, employing maximum barrier precautions during catheter insertion, and selecting alternative sites to avoid using the femoral site [11]. This potential loss of concentration may have contributed to the development of CLABSI in this patient. Adhering to CLABSI bundles has helped the hospital reach a zero rate of CLABSI infection [12]. This is the case when the central line is inserted in the ICU with maximum precautions through bundles application. However, in the emergency room during critical, life-saving situations, healthcare professionals may prioritize saving the patient's life over strict adherence to aseptic techniques when inserting central lines.

Despite being managed empirically, the patient continued to exhibit febrile episodes, necessitating the need for a change in the antibiotic regimen that was given to him when he started a fever. Furthermore, the lack of organism identification and sensitivity testing of the organism led to delays in appropriate diagnosis and treatment of the patient, and this may increase patient suffering, subsequent infection, and the bed occupancy [13]. It must be stated however that the laboratory plays a critical role in identifying the causative organism(s) and their susceptibility pattern. The initial positive blood culture for CNS was potentially viewed as a contaminant, leading to the delayed identification of the true causative organism and subsequent inadequate therapy. Dubourg et al. [14] suggested that rapid bacterial identification, particularly in blood culture samples, can be facilitated through methods such as using a Matrix Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS identification machine), which enables rapid organism identification and recovery. It is crucial for laboratory staff to deliver timely and accurate identification and susceptibility testing data to assist in clinical decision-making, particularly in the case of patients in the ICU. However, in this particular hospital, the MALDI-TOF MS machine is not available. The case study illustrates how misunderstanding blood culture results initially resulted in a delay in administering the appropriate antibiotic therapy to the patient. This underscores the necessity for robust training of laboratory technicians to recognize significant findings and to know when to promptly communicate with clinicians or at least their microbiology supervisor. Effective communication between laboratory personnel and treating clinicians is vital for optimal patient outcomes, as supported in the literature [15]. What is more, laboratory professionals should be adaptive at identifying abnormal or unexpected results and should have clear protocols on when to engage with physicians for further discussions. This proactive approach can help prevent treatment delays and enhance patient care, particularly for ICU patients.

This case report also highlights the significant role of the infection control doctor, particularly in monitoring to identify patterns of infections within the hospital setting [16]. As stated by Drexler [17], the infection control doctor (ICD) core responsibility within his professional duties, seeks to recognize HAI and take measures towards curtailing its spread. Working in collaboration with other medical practitioners within the healthcare facility, the ICD appraises diagnosis and implements preventive measures to mitigate its escalation. The importance of this role was evident as he identified an instance of this CLABSI case and intervened proactively to prevent any further detrimental outcomes. And this what is known as active surveillance [18]. The ICD was able to pick up on a recurring pattern of positive results for CNS in the hospital, leading to further investigation and ultimately to prompt the identification of the true causative organism: *S. haemolyticus*. This approach cannot be achieved without proper collaboration with other hospital departments, especially the lab and critical wards such as the ICU. The prompt collaboration is crucial in ensuring successful management of patients with CLABSI. The present case report outlines the importance of timely and accurate identification of the causative agent in such types of infections.

CONCLUSION

In this case, a diabetic patient with multiple trauma was admitted to the ICU for management and subsequently developed a febrile illness associated with central line insertion, initially attributed to an empirical antibiotic regimen. However, upon the identification of the causative organism as *S. haemolyticus* and its antibiotic sensitivity profile, appropriate therapy was promptly initiated, resulting in a favorable outcome. Proper training for laboratory technicians in recognizing and communicating critical results to treating clinicians is essential for optimal patient care. The role of the ICD is vital in monitoring hospital infections and aiding in their control. Additionally, the collaboration between infection control doctors, laboratory professionals and ICU is crucial in detecting CLABSI and guiding appropriate antibiotic therapy.

Authorship Contribution:

M. Halwani contributed to the study conception and design. Material preparation, data collection and analysis; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

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