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CASE REPORT

Brucella anthropi bacteremia in an immunocompromised patient due to severe burn infection

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Abstract

We present a clinical case of *Brucella anthropi* bacteremia associated with a central line catheter in an immunocompetent patient with a long hospital stay owing to complications from a burn injury. This is a man in his 20s who was admitted several days after being burned with oil (chicken fat) on the chest, upper limbs, genital area, and thighs, affecting 12% of the total body surface. The patient underwent various surgical procedures and subsequent skin grafting. The patient's progress was good after infection associated with the central venous catheter was treated, and the lesions were covered.

Keywords: Bacteremia; Burns; Central Venous Catheter

Bacteriemia por *Brucella anthropi* en un paciente inmunocomprometido debido a una infección severa asociada a quemadura

Resumen

Presentamos un caso clínico de bacteriemia por *Brucella anthropi* asociada a catéter venoso central en un paciente inmunocompetente con ingreso prolongado por complicaciones asociadas a una lesion por quemadura. Se trata de un varón en sus veintes, que ingresó varios días después de sufrir una quemadura por aceite (aceite de pollo), que afectó fundamentalmente tórax, miembros superiores, zona genital y muslos, comprometiendo el 12% de superficie corporal total, por lo que fue sometido a varios procedimientos quirúrgicos y a injertos cutáneos. El paciente evolucionó favorablemente tras el tratamiento de la infección asociada al catéter venoso central y la cobertura de sus lesiones.

Palabras clave: Bacteriemia; Quemaduras; Catéter venoso central

Introduction

The genus *Brucella* belongs to the class alpha-proteobacterial, this genus is integrated by 29 validated species. Recently, a new member was recategorized in this genus and came from another known as Ochrobactrum. *Ochrobactrum antrophi*, now *Brucella antrophi* is a gram-negative, rod-like, non-fermenting bacterium found in a wide variety of environments such as water, soil, plants, and animals. They are considered low-virulence pathogens and have recently been associated with opportunistic infection[1]. As they can be found not only in natural environments, but also in water sources, including normal saline, antiseptic solutions, and dialysis, with a robust survival ability, they are mainly associated with hospital-acquired infections, affecting mainly immunocompromised hosts with medical invasive devices[2,3]. Management is complicated by its reported resistance profile to the most commonly used beta-lactams, such as cephalosporins and penicillin[4].

Case report

A 28-year-old patient presented to the emergency department of a burn center with a scald burn injury. At the time of admission, the patient had a 20% burned body surface area, affecting both wrists and hands with third-degree burns, both thighs, and legs with second-degree burns, similar to the penis and scrotum. The patient underwent seven surgical wound toilets and debridement.

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On the 29th day after the burn injury, he was transferred to our center. Upon admission, the patient had a 12% burned body surface area without clinical signs of infection and a subclavian right central line.In the first hours of hospitalization, the patient presented 2 hours fever, central and peripheral blood cultures and urine cultures were taken, and the central line and urinary catheter were removed.

On the day after admission, the patient underwent tangential excision and grafting in the burned areas. On the first day after taking, blood cultures from central line were reported positive, with Gram stain showing gram-negative bacilli (figure 1-a*).* After 48 hours of inoculation, a Gram negative, non-lactose fermenter bacillus was reported in both blood cultures taken from central line and catheter tip culture (figure 1-b) and empirical meropenem was administered.

Brucella anthropi was identified in the central line and catheter tip cultures using Vitek MS. The reported susceptibilities of the bacteria were cephalosporin, carbapenem, and colistin resistance, and the rest of the antibiogram was susceptible; therefore, meropenem was suspended, and the patient was treated with levofloxacin.

Six days after removal of the central line, the patient had no new events of fever, no clinical signs of bacteremia, no other clinical signs of infection, serum inflammatory markers normalized, and wounds showed no signs of infection. Therefore, the patient continued medical treatment at home for two weeks.

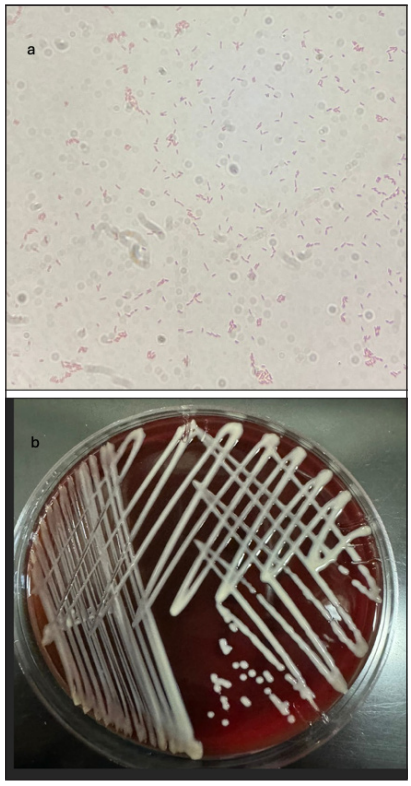

Figure 1. a) blood central line cultures in gram stain light microscopic examination showing clusters of gram-negative bacilli. b) *Brucella anthropi* in blood agar after 48 hours of incubation.

Discussion

Immune dysfunction is a hallmark of critical illness. Severe burn injuries are associated with proinflammatory and anti-inflammatory responses, leading to immunosuppression[5]. In severe burn injuries, there is a prolonged and strong immune response, leading to multiple systemic effects such as multiple organ failure due to systemic inflammatory response syndrome (SIRS)[6]. Immunosuppression and prolonged inflammatory response lead to infectious complications[7].

Pathogens affecting burn patients change over time; the first days of hospitalization are those of the skin flora and occasionally those of the digestive system. During prolonged hospitalization, these pathogens are replaced by colonization by hospital bacteria, mainly gram-negative bacilli, such as *Pseudomonas aeruginosa* and other *Enterobacterales*[8].
One of the main infections in burn patients is bloodstream infections. Most patients with severe burn injuries have invasive devices such as central bloodline catheters, which are the optimal port of entrance to the bloodstream[9]. Moreover, severe burn injuries are associated with prolonged hospital stay, and most patients undergo multiple surgical procedures, which increase the risk of bloodstream infections[10].

Pathogens associated with these infections are mainly Gram-negative rods, like *Pseudomonas aeruginosa, Klebsiella pneumoniae, Acinetobacter baumannii* and yeast like *Candida spp.*[11]. With the worldwide increase in antibiotic resistance, burn patients are at high risk of acquiring infections by multidrug-resistant (MDR) organisms[12].

Brucella anthropi has been recognized as an opportunistic emerging infection associated with a long hospital stay, invasive medical devices, and immunocompromised hosts. *The Brucella* genus consists of non – fermentative, strictly aerobic, oxidase-positive, and indole rapid-negative gram-negative rods[13].

Brucella anthropi has been reported as an etiological agent associated with infection. In their literature review, Ryan et al. *Brucella anthropi* was associated with 46 bloodstream infections that were usually associated with catheters, 14 septicemia, two biliary sepsis, nine endophthalmitis, eight peritonitis, four pneumonia and two endocarditis[14].

Treatment with *Brucella anthropi* represents a therapeutic challenge because of its increased association with resistance, and most isolates have been reported to be resistant to β-lactams due to a chromosomal, induced AmpC β-lactamase, which is resistant to clavulanic acid inhibition. It is generally considered to be susceptible to quinolones, trimethoprim/sulfamethoxazole, and colistin[15].

In this clinical case, we present a bloodstream-related infection caused by *Brucella anthropi* in a previously healthy patient with a severe burn injury. The main associated risk factors were prolonged hospital stay, use of intravenous devices, multiple surgical events within the course of hospitalization, and use of broad-spectrum antibiotics. Microbiologic identification was performed using biochemical tests and confirmed with Vitek

MS; however, reports of antibiotic susceptibilities were challenging because initial resistance to quinolones was discordant between isolations. Therefore, manual susceptibility tests were performed to confirm the susceptibility patterns. Genus Brucella are facultative intracellular parasites. Recently, Brucellae merged with *Ochrobactrum* spp. in the genus *Brucella,* based only on global genomic analysis. Some microbiologists believe this is incorrect because it was performed without a thorough phylogenetic analysis and poses a risk to those working with brucellosis. They suggested that the terms *Ochrobactrum* and *Brucella* remain valid separately[16].

In conclusion, *Brucella anthropi* is a gram-negative bacillus recently associated with opportunistic infections in immunocompromised hosts. Infections related to these bacteria are primarily bloodstream infections. Patients with severe burn injuries are at an increased risk of developing complicated infections due to immune dysfunction.

The diagnosis and treatment of *Brucella anthropi* infections are challenging because of low clinical suspicion, different methods of identification, and resistance patterns. In this clinical case, the patient had multiple risk factors that increased the risk of acquiring opportunistic infections, and identification was performed in the microbiology laboratory.

To our knowledge, this is the first report of *a Brucella anthropi* bloodstream infection in a patient with severe burns. We conclude that knowledge of the prevalence of infections associated with this microbiological agent, methods of identification, and resistance patterns must be increased to raise awareness of the capability of infection and complications of this agent and to provide better and more effective treatment strategies in high-risk populations.

Ethical considerations

Protection of persons. No experiments were performed on humans or animals.

Protection of vulnerable populations. The patient described in this clinical case is not part of a vulnerable population.

Confidentiality. We have considered the confidentiality of personal data have been respected.

Privacy. We have considered the privacy of personal data have been respected.

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Conflict of interests. The authors have no conflict of interest to declare.

Acknowledgments. To our knowledge, this is the first case of bacteremia associated with this bacteria, whose nomenclature has recently changed, in a severely burned patient. A germ that also represents a challenge for its identification and typing in the clinical microbiology laboratory.

Authors´ contribution. CB, EV, AM: clinical care of the case; conception and design of the manuscript as well as documentation of the case. EL, MM: microbiological diagnostic procedures, bacterial identification and revision of the document. All authors contributed to read and approved the version of the submitted manuscript.

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