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Case report | Prikaz bolesnika

Pasteurella multocida cellulitis, bacteremia and lower respiratory tract infection: a rare case

Celulitis, bakterijemija i infekcija donjih dišnih puteva uzrokovani bakterijom *Pasteurella multocida:* rijedak slučaj

Aristos Aristodimou[1], Andri Panteli[1], Zacharias Raptopoulos[1], Panagiotis Papastergiou[2], Loukia Dramiotou[1]

[1] Internal Medicine Department, Limassol General Hospital, State Health Organization Services, Limassol, Cyprus
[2] Microbiology Department, Limassol General Hospital, State Health Organization Services, Limassol, Cyprus

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✉ **Corresponding author:**
Aristodimou Aristos, MD, MScHP, MScPH,
Internal Medicine Department, Limassol General Hospital.
Email: a.aristodimou@gmail.com
Alternate author:
Zacharias Raptopoulos, MBBS,
Internal Medicine Department, Limassol General Hospital.
Email: zac51055@gmail.com

Summary

Pasteurella multocida infection is a zoonotic disease causing skin and soft tissue infection (SSTI) but disseminated disease has also been reported in literature. We describe a rare case of *Pasteurella multocida* bacteremia in a 61-year-old, immunocompetent, woman presenting with left lower leg cellulitis and a lower respiratory tract infection.

Sažetak

Infekcija uzrokovana bakterijom *Pasteurella multocida* zoonoza je koja najčešće uzrokuje infekcije kože i mekih tkiva (SSTI), no u literaturi su opisani i diseminirani oblici bolesti. Prikazujemo rijedak slučaj bakterijemije uzrokovane bakerijom *Pasteurella multocida* u 61-godišnje imunokompetentne bolesnice koja je imala celulitis lijeve potkoljenice i infekciju donjih dišnih puteva.

Introduction

Pasteurella multocida is a Gram-negative coccobacillus that forms part of the oral, nasal, gastrointestinal and upper respiratory tract of many mammals and bird species[1,2]. Infection by *Pasteurella multocida* most commonly implicates exposure to dogs and cats, but reports suggest it often colonises rabbits, cows, and buffalos[3]. Bacterial transmission occurs through scratching, biting and even licking by the colonised animal with recent data reporting *Pasteurella multocida* being the most commonly cultured bacterium from infected wounds[4]. It is also worth noting that the infection is transmitted to humans more often after exposure to a cat than to a dog, with carrier rates of 70-90% and 20-50%, respectively[4]. The most frequently encountered *Pasteurella* infection is that of the skin and soft tissues (cellulitis), with pulmonary infection being the second most common, especially in patients with underlined lung pathology[4]. Disseminated infection and multi-organ involvement has also been reported, affecting the bones and joints, the central nervous system and the heart (endocarditis)[4].

The case presented herein concerns an immunocompetent patient without any underlying lung pathology who was admitted due to traumatic cellulitis and lower respiratory tract infection, complicated by *Pasteurella multocida* bacteremia. This is considered a rather uncommon presentation as the majority of cases with disseminated disease involve immunocompromised patients and only two case reports describe *Pasteurella* pneumonia in immunocompetent patients with disseminated bacteremia but without cellulitis[5].

Case presentation

A 61-year-old female, with past medical history of hypertension, chronic venous insufficiency, diaphragmatic hernia and abdominal hernia, was transferred to the Emergency Department of Limassol General Hospital due to a 5-day history of fever (up to 39ºC) associated with one episode of vomiting earlier that day. Upon presentation, the patient was febrile (39ºC), hemodynamically stable (blood pressure 110/70 mmHg) and with a Glasgow Coma Scale (GCS) of 14/15 (M6 V4 E4). Heart sounds were normal without any murmurs, rubs or gallops. Auscultation of the lung fields revealed decreased sounds on the left base with corresponding oxygen saturation of 91% on room air. Abdominal examination was unremarkable. Examination of the nervous system was significant for confusion (orientated only to self) but no other abnormalities were noted. Inspection of the lower extremities demonstrated dark discolouration of the right leg and erythema, warmth and, tenderness on the left tibia. A non-inflamed, non-tender scar was present over the foot (Figure 1). Pulses were palpable bilaterally. Initial blood tests were significant for leukocytosis (10,770 cells per μL) with 91.8% neutrophils (absolute neutrophil count 9870 cells per μL), mildly elevated serum creatinine (1.11 mg/dL), raised C-reactive protein (CRP) (43.5 mg/dL) and procalcitonin levels of 1.86 ng/mL. Due to the confusion noted on clinical examination along with mild hypoxia, an arterial blood gas (ABG) was drawn and revealed type I respiratory failure with pH of 7.45, paCO2 36.2 mmHg and paO2 59.5 mm Hg – mild lung injury (PaO2:FiO2 – 283.3).

Further tests included an electrocardiogram (sinus rhythm), rapid antigen testing for SARS-CoV-2, Influenza type A and B were negative. Urine analysis was within normal range. A computed tomography (CT) of the brain was performed, revealing no acute intracranial abnormality and a chest X-ray showed elevated left hemidiaphragm, with estimated accompanying atelectasis. A Doppler ultrasound of the left lower leg ruled out deep vein thrombosis (DVT). Blood cultures were collected and treatment was empirically commenced with ceftriaxone and azithromycin. On the second day vancomycin was added in the treatment scheme. The laboratory informed that a Gram-negative coccobacillus was isolated from the blood culture. The following day, the automated laboratory system (VITEK 2, bioMérieux) could not provide a definitive identification. The isolate was forwarded to the national reference laboratory for identification with a MALDI-TOF mass spectrometry (MS). The organism was finally identified as *Pasteurella multocida.* The organism was susceptible to benzylpenicillin, cefotaxime, ciprofloxacin and trimethoprim/sulfamethoxazole (EUCAST standardised method). The antibiotic treatment regimen was modified to piperacillin/tazobactam and all other antibiotics were discontinued. The patient received 14 days of parenteral antibiotic therapy, with a quick clinical and biochemical response. The confusion that was present upon admission, subsided on day 3 and a more detailed animal contact history was taken. The patient recalled a minor bite from her pet dog on the left foot several weeks ago, for which she neither sought medical care nor applied any local antiseptics. Upon completion of the antibiotic treatment, she was discharged without any follow-up needed.

Figure 1 Cellulitis of the left lower leg
Slika 1 Celulitis lijeve potkoljenice

Discussion

According to the Centers for Disease Control (CDC), in 2022, there were reports of 400,000 cat bites and 4.7 million dog bites in the United States of America (USA)[6]. The average incubation period is about 10 days, but in about one-third of patients presentation may be delayed by up to a month[7] – as in the case described above. *Pasteurella multocida* has been serologically classified into five different serogroups according to the composition of the polysaccharide membrane (A,B,D,E,F), which is one of the main virulence factors of the bacterium[4]. Other notable virulence factors include the liposaccharide membrane, iron-binding proteins and the *Pasteurella* toxin[4]. Diagnosis is based on culturing the bacterium from blood or tissue sample[4]. The first-line antibiotic treatment for local *Pasteurella* infection includes penicillin or its derivatives, doxycycline, trimethoprim/sulfamethoxazole[4]. Penicillin or its derivatives are also considered first-line, but resistance can occur, so a culture and sensitivity test is crucial for severe infections to guide treatment[4]. For disseminated disease, guidelines suggest monotherapy with ampicillin/sulbactam or piperacillin/tazobactam or dual antibiotic therapy with ceftriaxone plus metronidazole or clindamycin[4].

The most common manifestation of *Pasteurella multocida* infection is skin and soft tissue infection (SSTI) which can subsequently disseminate in immunocompromised and/or elderly individuals[8]. Among immunocompetent individuals, *Pasteurella multocida* pneumonia remains exceedingly rare and has been documented only in case reports[8]. The proposed mechanism involves upper respiratory tract colonization following exposure to animal saliva, particularly from dogs and cats[8]. There are 12 published case reports describing pneumonia, with or without bacteremia, in immunocompetent hosts[5,8]. Guilbart and others reported a case of a patient with fulminant *Pasteurella multocida* disease, beginning with a right leg SSTI, followed by dissemination to the blood, joints and mitral valve[9]. No pulmonary involvement has been mentioned[9]. A study conducted by Wei et al. recorded 482 cases of *Pasteurella multocida* infection from 1964 to 2023 across several continents (America, Europe and Asia) and examined the route of infection and the clinical manifestations[7]. Disseminated infections have been reported, but none have described infection of the skin, lungs and bacteremia at the same time[7]. The present case represents an uncommon manifestation of disseminated *Pasteurella multocida* infection, characterised by an atypical clinical course and multiple infectious foci. It underscores important diagnostic and therapeutic considerations with notable teaching value. There are several causes of dissemination in an immunocompetent patient: hypertension, chronic venous insufficiency, and other factors that dampen the immune response. Sun and colleagues state that hypertension implies cardiovascular disease that could be associated with worse outcomes in sepsis since patients have impaired compensatory mechanisms[10].

Conclusion

In conclusion, while *Pasteurella multocida* is a recognized cause of soft-tissue infection, respiratory disease, and occasional bacteremia, a search of major medical databases yielded no prior reports describing the simultaneous presentation of these three syndromes in a single patient. This case contributes novel clinical insight and underscores the importance of considering *P. multocida* in patients with compatible exposure histories and multi-system involvement.

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Conflicts of interest

There are no conflicts of interest.

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