Figurate urticaria as a presenting sign of *Capnocytophaga canimorsus* bacteremia after dog bite

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INTRODUCTION

Capnocytophaga canimorsus is a Gram-negative, fastidious bacillus found in the oral flora of dogs and, less commonly, cats. The first reported case of *C. canimorsus* infection was published in 1976, and there have been nearly 500 more since.[1] Many patients have cutaneous manifestations, most commonly petechiae, purpura, gangrene, and cellulitis.[2] We describe a rare case of *C. canimorsus* bacteremia associated with figurate urticaria.

CASE REPORT

A 48-year-old female with past medical history significant for alcohol use disorder presented to the emergency department for joint pain, body aches, self-reported fever, and fatigue following a dog bite 3 days prior. Her vital signs were normal and laboratory workup was significant only for elevated inflammatory markers, erythrocyte sedimentation rate and C-reactive protein. She was given 6 mg dexamethasone and discharged. She returned to the hospital 3 days later with a fever of 103.6 °F, polyarthralgia, and a worsening rash.

Her joint pain was worse in her hands, although x-rays were unremarkable. A chest x-ray showed bilateral infiltrates. The patient denied dyspnea, cough, or other respiratory symptoms but was hypoxic and required supplemental oxygen via nasal cannula. Her white cell count was 16,300/uL. On physical examination, the patient had large, well-demarcated, annular and arcuate, mildly erythematous plaques with dusky erythema or purpura (Figs 1 to 3). The lesions were present on her back, trunk, and extremities without mucosal involvement. The differential diagnosis of her rash included urticarial vasculitis, erythema marginatum, granuloma annulare, erythema annulare centrifugum, subacute cutaneous lupus erythematosus, and erythema migrans.

After blood cultures were obtained, empiric treatment was initiated with vancomycin and aztreonam for broad-spectrum coverage, then transitioned to azithromycin with concern for possible atypical pneumonia (later ruled out), and finally, ceftriaxone for its general coverage of Gram-positive and Gram-negative organisms and ease of transition to outpatient therapy. Empiric intravenous methylprednisolone was also initiated for its anti-inflammatory properties. An infectious work up was negative for Lyme, mycoplasma, legionella, streptococcus, SARS CoV-2, hepatitis, and HIV. Airway samples obtained from bronchoscopy were negative for a complete respiratory viral panel, Gram stain, bacterial and fungal cultures, and cytology. Blood cultures throughout admission showed no growth. An autoimmune work up was negative including antinuclear antibody, antineutrophil cytoplasmic antibodies, cryoglobulins, rheumatoid factor, and complement studies. Despite a non-diagnostic workup, the patient improved on antibiotics and steroids. Antibiotics were ultimately discontinued and she

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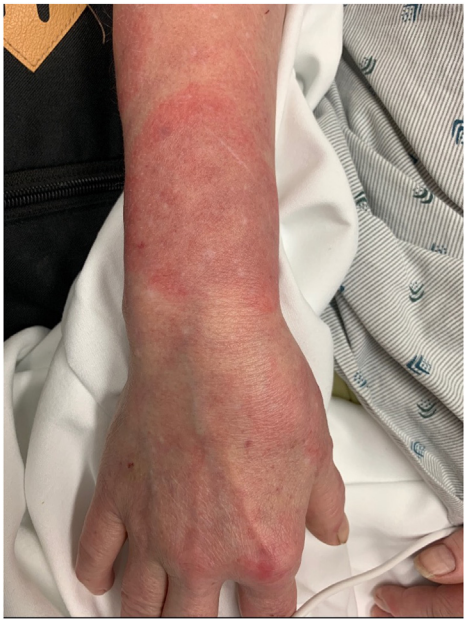

Fig 1. An annular plaque with erythematous borders and central dusky erythema on the right distal dorsal forearm.

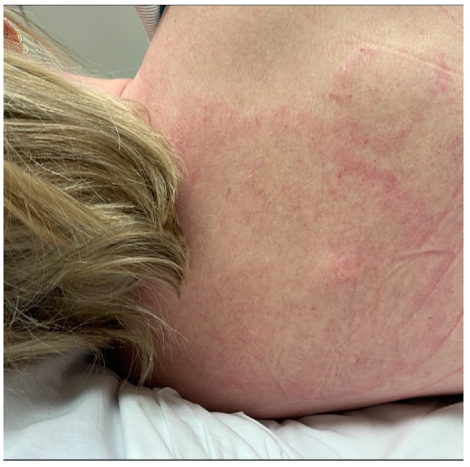

Fig 2. Large mildly erythematous annular plaques with central clearing on the upper back.

was discharged on 40 mg of oral prednisone daily with intent to taper pending outpatient dermatology follow up.

Following discharge, and 5 days after the initial blood draw, blood cultures demonstrated Gram-negative bacilli identified as *C. canimorsus*. The patient received levofloxacin daily to complete a total of 11 days of antibiotics therapy. The patient reported continued improvement immediately after discharge, but was lost to long-term follow up.

DISCUSSION

C. canimorsus ("canimorsus" is Latin for "dog bite") is a fastidious, Gram-negative bacillus that is capnophilic (it grows optimally on cultures in an enriched carbon dioxide environment of 5%-10%). It has been identified in the oral flora of approximately 24% to 74% of dogs and 17% to 57% of cats, the lower numbers representing cultures, the higher ones from techniques including polymerase chain reaction testing.[1,3-5] Infections arise in the setting of a dog or cat bite in 54% of cases, from scratches in 8.5% of cases, and close contact or licking in 27% of cases. However, in approximately 10% of cases, a source of infection is not identified.[1,3] The greatest risk factors for infection are alcoholism and asplenia.[3,6] Other risk factors include age greater than 50 years old, cirrhosis, corticosteroid use, immunosuppression, neutropenia, hemochromatosis, cigarette smoking, and thalassemia.[1] Still, more than 40% of cases occur in patients with immunocompetence with no obvious risk factor.[4] The mean age of reported infections is 55 years old with a male to female ratio of 1.9:1.[7] The overall mortality rate of *C. canimorsus* bacteremia is 25% to 30% but rises to 60% in the setting of septic shock.[1,3,6]

To date, nearly 500 cases of infection with *C. canimorsus* have been reported, though this number may be deceivingly low due to the difficulty isolating and identifying the bacterium.[1] With an incubation time of 2 to 7 days from animal exposure to illness, identification typically takes an additional 8 to 14 days after symptom onset, delaying or preventing diagnosis altogether.[3,6] Methods of identification include blood or cerebrospinal fluid culture, mass spectrometry, and in recent years, polymerase chain reaction.[2,5]

Initial infection typically presents as fever and general malaise. Severe infection most commonly results in sepsis but may also lead to bacterial endocarditis, meningitis, disseminated intravascular coagulopathy, septic arthritis, acute renal failure, pneumonia, or Waterhouse–Friderichsen syndrome.[1] If infection follows a dog bite or scratch, there is usually minimal or no inflammation at that site. Cutaneous manifestations are common and primarily include petechiae, purpura, gangrene, cellulitis, and widespread purpura fulminans.[3,8-10] Rarely, severe hemorrhagic blistering and skin desquamation may develop.[6] Lesions may be painful, pruritic, or entirely asymptomatic. Mucosal surfaces are typically spared. If a skin biopsy is performed, histopathological evaluation may demonstrate nonspecific superficial perivascular infiltrates without evidence of vasculitis.[3,5,6] According

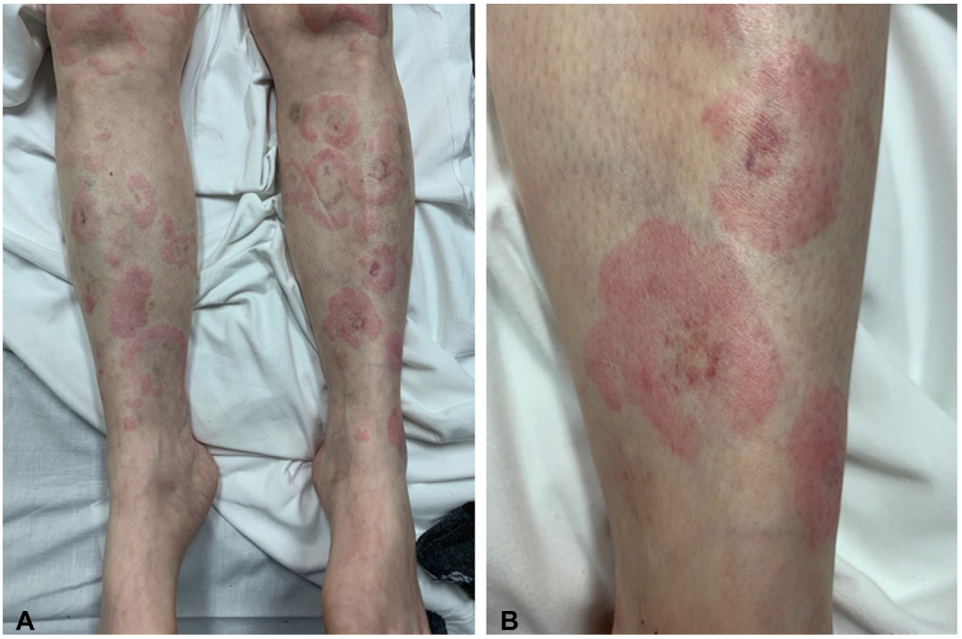

Fig 3. Numerous well-circumscribed, erythematous, arcuate plaques on the bilateral lower extremities (**A**) demonstrating central clearing with petechiae and purpura (**B**).

to documented reports, most rashes resolve within 2 to 5 days of antibiotic administration.[2]

The recommended empiric treatment for dog and cat bites is amoxicillin-clavulanic acid which provides coverage of both aerobic and anaerobic bacteria commonly found in the mouths of these animals.[5] *C. canimorsus* is also sensitive to third generation cephalosporins, clindamycin, doxycycline, and carbapenems. Resistance to trimethoprim, aztreonam, aminoglycosides, and fosfomycin has been reported.[6,10] Unfortunately, no clear guidelines exist for the duration of treatment.

CONCLUSION

We present this case of figurate urticaria to highlight the variety of cutaneous manifestations of *C. canimorsus* infection. In the appropriate clinical context and when contact with a dog or cat is confirmed or suspected, *C. canimorsus* should be considered. Patients with a history of alcoholism, as in our case, or asplenia are at greatest risk following a dog bite or scratch. Prompt identification of the causative pathogen and treatment with empiric, broad-spectrum antibiotics is crucial to limiting the progression of cutaneous and systemic disease. Polymerase chain reaction sequencing may offer a faster alternative to blood or cerebrospinal fluid cultures thus expediting identification and ultimately treatment. Close monitoring for progression of symptoms and supportive measures are essential, as patients who develop sepsis have the highest mortality rate.

Conflicts of interest

None disclosed.

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