



CASE REPORT

Fatal case of *Capnocytophaga* sepsis from a dog bite in a patient with splenic hypoplasia

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Abstract

Background: *Capnocytophaga canimorsus* is an oral commensal bacteria in dogs and may cause severe infection following a dog bite. This is a case of fatal *C. canimorsus* sepsis with acute infectious purpura fulminans (AIPF) in a healthy patient with splenic hypoplasia.

Case Presentation: A healthy 49-year-old man was admitted to the intensive care unit (ICU) for septic shock and AIPF 4 days after a dog bite to his mouth. Computed tomography revealed a small spleen measuring 53 cm³ but no other source of infection. Despite intensive care, the patient died of multiple organ failure and progressive shock on the fifth ICU day. Polymerase chain reaction of blood samples identified the *C. canimorsus* gene on a later day.

Conclusion: *Capnocytophaga canimorsus* from dog bites may cause fatal AIPF. Splenic hypoplasia and bite wounds in well-perfused areas such as the oral cavity are possible risk factors for sepsis. All dog bites should warrant medical attention.

KEY WORDS

bite and sting, emergency treatment, purpura fulminans, sepsis, spleen

INTRODUCTION

Animal bites, mostly from dogs or cats, are frequently encountered in emergency departments. The infection rate from cats is as high as 28%–80%,¹ and prophylactic antibiotic therapy is prescribed widely. Meanwhile, the infection rate from dog bites is reported to be 3%–18%,¹ and prophylactic antibiotics are recommended only in severely contaminated bites or patients with immunosuppressive conditions such as diabetes mellitus.²

Dogs and cats are the most familiar animals and are frequently owned as pets worldwide. *Capnocytophaga* is a commensal bacteria found in the oral cavity of dogs and cats. *Capnocytophaga* infection after dog or cat bites has increased in recent years. Severe infections have been reported, even in healthy individuals.³ This is a case of fatal *Capnocytophaga* sepsis with purpura fulminans

following a dog bite in an otherwise healthy male with splenic hypoplasia.

CASE REPORT

A 49-year-old man, with no known comorbidities, was bitten in the oral cavity by his pet dog. He had been bitten many times previously but never developed symptoms nor visited a clinic or a hospital. Two days following the bite, he developed fever with chills. On the fourth day postinjury he developed purpura and was transported to the community hospital. Septic shock was suspected and he was transferred to our tertiary care center for critical care.

On admission he was conscious and coherent but was received with an oxygen face mask at 10 L/min and nor-adrenaline drip at 0.1 µg/kg/min. His blood pressure was

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127/99 mmHg, heart rate 151 b.p.m., respiratory rate 38 breaths/min, and body temperature 37.1°C. His SpO₂ was unmeasurable despite oxygen support. The dog bite on his mouth had healed but the purpura had spread extensively, especially on his face and lower extremities (Figure 1). Blood tests revealed lactic acidosis, thrombocytopenia, coagulopathy, renal failure, and elevated C-reactive protein levels (Table 1). Computed tomography showed a small spleen (53 cm³), although the source of the infection could not be identified (Figure 2). The patient was intubated and resuscitated with massive fluid and platelet transfusion.

Capnocytophaga sepsis and acute infectious purpura fulminans (AIPF) resulting from the dog bite was suspected. Due to his rapid deterioration, toxic shock syndrome from fulminant pneumococcal infection, fulminant hemolytic streptococcal infection, and fulminant staphylococcal infection was considered. Empiric intravenous antibiotic therapy with meropenem (1 g q8h), vancomycin (1 g q12h), ampicillin/sulbactam (3 g q6h), and clindamycin 600 mg q8h was started. Intravenous hydrocortisone (200 mg daily) was given for relative adrenal insufficiency, and continuous renal replacement therapy was initiated. Immunoglobulin and other blood products were also given.

On the second day of admission, blood cultures from the community hospital revealed Gram-negative rods. Because of the protracted profound shock with hyperlactatemia, high-dose vasopressors could not be reduced. Coagulopathy and thrombocytopenia persisted despite continuous transfusion. The patient died of multiple organ failure and progressive shock on the fifth ICU day. Subsequently, Japan's National

Institute of Infectious Diseases confirmed the pathogen as *Capnocytophaga canimorsus* by polymerase chain reaction of blood culture samples from the community hospital and our center. The capsule serovar of *C. canimorsus* was type D.

DISCUSSION

Capnocytophaga is an encapsulated, filamentous Gram-negative rod and is one of the commensal bacteria in the oral cavity of dogs and cats.⁴ Among *Capnocytophaga*, *C. canimorsus* is found in 74% of dogs and 57% of cats in Japan,⁵ and is the most frequent cause of *Capnocytophaga* infections following dog or cat bites. Immunocompromised conditions, such as postsplenectomy, cirrhosis, alcoholism, diabetes, and steroid use are risk factors for *C. canimorsus* infection.³ Infection cases have mainly been reported in middle-aged and older men. However, the mortality rate is 30% in healthy individuals without risk factors.⁶ Splenic hypoplasia and immune competence are not visually apparent. It may include people who have not been diagnosed as immunocompromised, as in our case.

The spleen is the most significant lymphoid tissue that primarily produces immunoglobulin M, which is necessary for opsonization of encapsulated bacteria. In splenic dysfunction or asplenia, macrophages phagocytose fewer bacteria, making the patient more susceptible to infection. Decreased splenic volume is considered indicative of splenic dysfunction and a risk factor for severe infection, such as AIPF.^{7,8} The splenic volume of the patient was 53 cm³, which was significantly smaller than the average splenic volume of

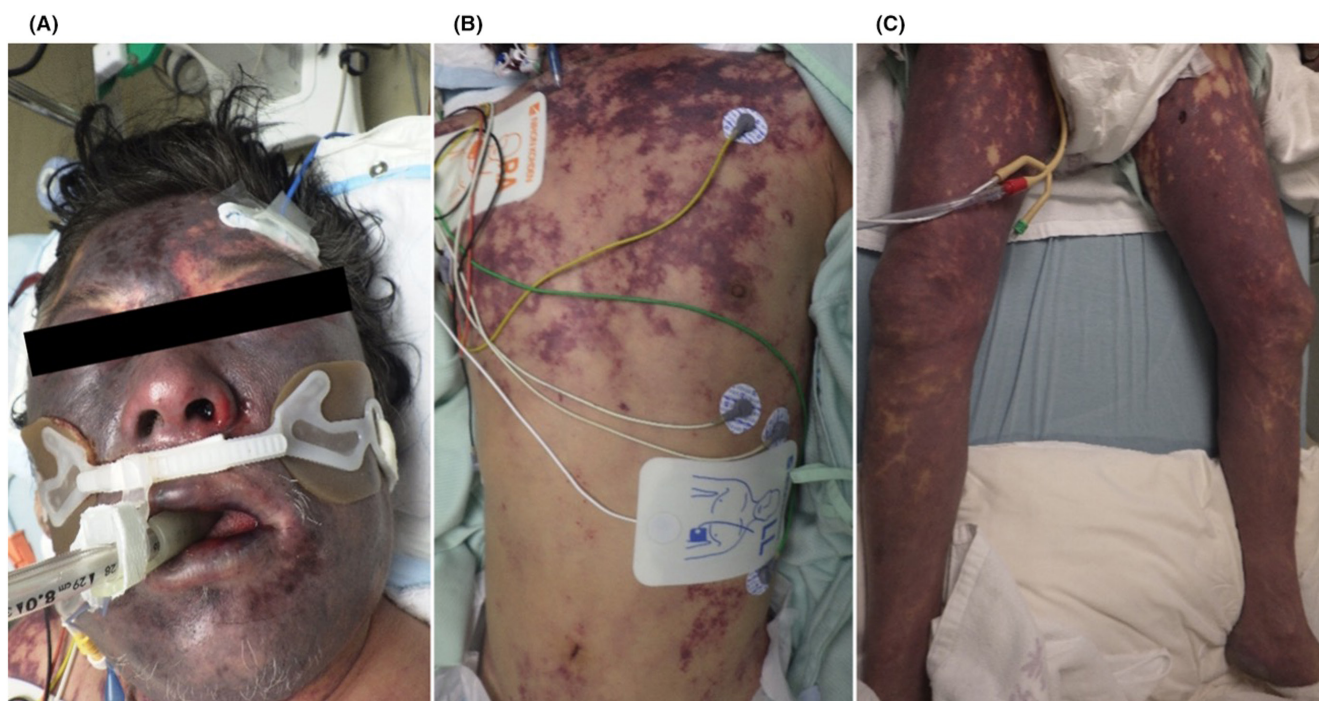


FIGURE 1 Purpura of the (A) face, (B) chest, and (C) lower extremities on admission of a 49-year-old man with *Capnocytophaga* sepsis from a dog bite.

TABLE 1 Laboratory data on admission of a 49-year-old man with *Capnocytophaga* sepsis from a dog bite.

Peripheral blood cell count		
White blood cells	4600	/ μ L
Red blood cells	415×10^4	/ μ L
Hemoglobin	14.5	g/dL
Platelet counts	0.8×10^4	/ μ L
Coagulation		
PT-INR	2.94	
APTT	158.7	sec
Fibrinogen	94	mg/dL
D-dimer	204.6	μ g/mL
Antithrombin-3	45	%
Serology, biochemistry		
Presepsin	2095	pg/mL
C-reactive protein	17.6	mg/dL
Total protein	4.9	g/dL
Albumin	2.5	g/dL
Total bilirubin	1.1	mg/dL
Aspartate transaminase	162	U/L
Alanine aminotransferase	48	U/L
Lactate dehydrogenase	714	U/L
Blood urea nitrogen	29	mg/dL
Creatinine	2.97	mg/dL
Sodium	134	mEq/L
Potassium	4.6	mEq/L
Chloride	101	mEq/L
Arterial blood gas (F _I O ₂ 1.0)		
pH	7.325	
pO ₂	94.6	mmHg
pCO ₂	17.1	mmHg
HCO ₃ ⁻	8.6	mmol/L
Base excess	-15.4	mmol/L
Glucose	61	mg/dL
Lactate	9.2	mmol/L

Abbreviations: APTT, activated partial thromboplastin time; PT-INR, prothrombin time - international normalized ratio.

127 cm³.⁹ Given that the patient had no known comorbidities, splenic hypoplasia was the possible risk factor for his fatal *C. canimorsus* infection and AIPF.

Although the patient was bitten many times previously, this specific dog bite was in the oral cavity, which is a blood-rich area with a possibly weaker mucosal barrier mechanism than the skin. The location of the bite could have contributed to the severity of the infection.

Capnocytophaga canimorsus has several capsule serovar types ranging from types A to M. Types A to C account for approximately 90% of *C. canimorsus* infections, while type D is less common, at approximately 8%.¹⁰ This case is the first fatal type D case and the second reported case in Japan. The pathogenicity of the capsule serovar is not yet known, and an accumulation of case series is needed.

Dogs and cats are the most familiar animals that are kept as pets worldwide. Pet owners are not adequately educated about the dangers of *Capnocytophaga* infection and the importance of prophylactic antimicrobial therapy. Some risk factors for infection, such as a hypoplastic spleen, cannot be recognized in advance. All people bitten by dogs or cats should seek early medical attention.

CONCLUSION

Capnocytophaga canimorsus infection may cause septic shock and fatal AIPF. In the present case, splenic hypoplasia and an oral wound were the most probable risk factors for sepsis. People bitten by dogs and cats should seek medical attention regardless of known risk factors.

ACKNOWLEDGMENTS

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CONFLICT OF INTEREST STATEMENT

None.

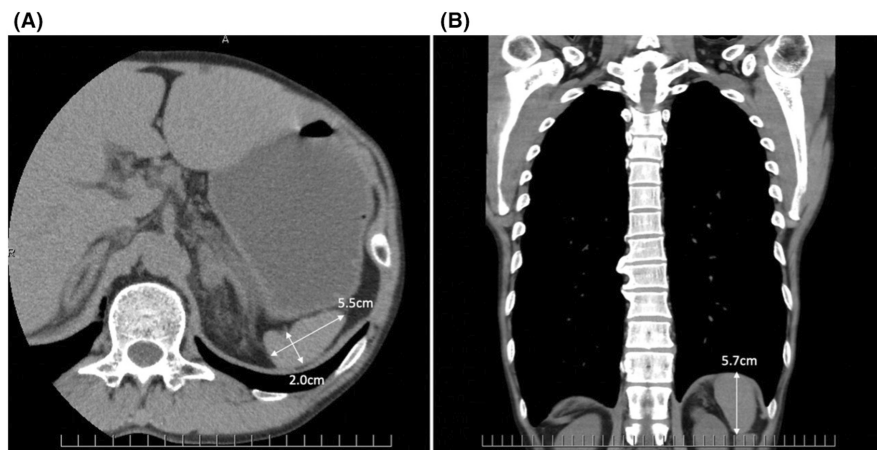


FIGURE 2 Abdominal CT images on admission of a 49-year-old man with *Capnocytophaga* sepsis from a dog bite. (A) Axial and (B) coronal view showing the hypoplastic spleen (white arrow).

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

ETHICS STATEMENT

Approval of the research protocol: N/A.

Informed consent: Written informed consent was obtained from the patient's family for the publication of this case report and any accompanying images.

Registry and registration no. of the study/trial: N/A.

Animal studies: N/A.

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