Shock following a cat scratch

Umpei Yamamoto,¹ Mutsumi Kunita,² Masahiro Mohri¹

¹Department of Cardiology, Kyushu Kosei-Nenkin Hospital, Kitakyushu, Japan

²Department of Cardiovascular Medicine, Kyushu University Graduate School of Medical Science, Fukuoka, Japan

Correspondence to

Dr Umpei Yamamoto,
umpei@po.saganet.ne.jp

SUMMARY

A 49-year-old man with fever, pain in both legs, purpuras and cyanosis was admitted to hospital. He was a heavy drinker, but did not have diabetes or other immunosuppressive disease. On admission, he was in shock, with haematological findings suggestive of disseminated intravascular coagulation, and liver and kidney failure. The presence of a scratch wound on his face caused by a cat, and linear, Gram-negative rods phagocytosed by polynuclear leucocytes on peripheral blood smear suggested *Capnocytophaga canimorsus* infection. On day 1, antibiotics (ampicillin/sulbactam) and catecholamines were initiated. The patient required haemodialysis three times per week for 3 weeks. His toes became necrotic but improved and amputation was not necessary. On day 52, he was discharged from hospital with only mild sensory impairment of the legs.

BACKGROUND

Capnocytophaga canimorsus is a Gram-negative, rod-shaped bacterium found in the oral flora of dogs and cats. Human infection with this bacterium is rare; however, once infection occurs, it can lead to sepsis and subsequent disseminated intravascular coagulation (DIC), septic shock and multiorgan failure. The death rate for such serious cases is reported to be approximately 30%. A prompt diagnosis is often difficult due to the fastidious growth of the organism. The present report describes a rescued case of *C canimorsus* infection, complicated by septic shock, DIC, multiorgan failure and purpura fulminans, in which a simple peripheral blood smear examination provided a diagnostic clue that facilitated prompt therapeutic planning.

CASE PRESENTATION

A 49-year-old man was referred to our hospital with fever and severe pain in both legs. He was a heavy drinker, but was not diabetic or hypertensive, nor did he have a history of splenectomy or transfusion. On admission, his blood pressure was 98/60 mm Hg, with a regular heart rate of 132 bpm and a body temperature of 32.4°C. His extremities were cold and cyanotic; his SpO₂ could not be measured using pulse oximetry. Extensive, reticulated purpuras, suggestive of intravascular coagulopathy and haemorrhage, were present in both legs (figure 1). A scratch wound 2 cm in length was noted below his nose (figure 2), which he reported was caused by a cat 3 days earlier.

INVESTIGATIONS

On admission, the patient's serum C reactive protein level was markedly elevated (35.74 mg/dL), and haematological examination revealed liver and kidney dysfunction and DIC (figure 3). A plain chest x-ray revealed a cardiothoracic ratio of 53%, with no sign of congestion. Cardiac ultrasonography showed diffuse

Figure 1 On admission, extensive purpuras were observed in the extremities.

severe hypokinesia of the left ventricle, with an ejection fraction of 26%. Electrocardiography revealed sinus tachycardia but no ischaemic ST-T changes. Whole-body CT scans showed no evidence suggesting infectious foci. On the day of admission, a Giemsa stain of a peripheral blood smear was performed and linear rods phagocytosed by neutrophils were recognised (figure 4). These bacteria were Gram-negative.

DIFFERENTIAL DIAGNOSIS

Possible pathogens following cat scratch include *Bartonella henselae*, *Pasteurella* and *C canimorsus*. The morphological features of Gram-negative rods, as shown by blood smear examination, strongly suggested *C canimorsus* as the causative bacteria in this particular patient.

TREATMENT

On day 1, the patient was intubated and mechanically ventilated, and was given high doses of dopamine, dobutamine and norepinephrine. Because *C canimorsus* was suspected as the pathogenic cause of his sepsis, ampicillin/sulbactam were selected and administered intravenously (6 g/day). Nafamostat mesilate, thrombomodulin- α and antithrombin were initiated to treat DIC. On day 2, anuria persisted and plasma exchange was started, followed by

Figure 2 On admission, a scar from a cat scratch was observed above the lips (arrows).

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Complete blood count		Blood chemistry		Serological test	
White blood cells	10000 / μ L	Total protein	6.6 g/dL	Ferritin	8256 ng/mL
Neutrophils	94.7 %	Albumin	3.7 g/dL	TSH	2.700 μ IU/mL
Eosinophils	0.1 %	Lactate dehydrogenase	752 IU/L	Free T4	1.03 ng/dL
Basophils	0.2 %	Aspartate aminotransferase	262 IU/L	BNP	283.5 pg/mL
Lymphocytes	4.4 %	Alanine aminotransferase	59 IU/L	sIL-2R	3460 U/mL
Monocytes	0.6 %	Blood urea nitrogen	35 mg/dL		
Red blood cells	374 $\times 10^4$ / μ L	Creatinine	3.68 mg/dL	Blood gas analysis	
Hemoglobin	13.1 g/dL	Sodium	132 mEq/L	pH	7.391
Hematocrit	37.1 %	Potassium	3.9 mEq/L	PCO ₂	19.6 mmHg
Platelets	10.0 $\times 10^4$ / μ L	Chloride	88 mEq/L	PO ₂	83.5 mmHg
Coagulation and fibrinolytic system		Calcium	8.1 mg/dL	HCO ₃ ⁻	11.6 mmol/L
Prothrombin Time	21.2 sec	Magnesium	1.1 mg/dL	Base excess	-12.5 mmol/L
APTT	106.8 sec	Total cholesterol	181 mg/dL	Lactate	68 mg/dL
Antithrombin III	57 %	Creatine phosphokinase	393 IU/L		
Fibrinogen	166.4 mg/dL	Glucose	115 mg/dL		
FDP	166.4 μ g/mL	Hemoglobin A1c	5.1 %		
D-dimer	49.6 μ g/mL	C-reactive Protein	35.74 mg/dL		

Figure 3 Laboratory data on admission.

haemodialysis. Haemodialysis was performed three times per week and was continued until day 24. Left ventricular function gradually improved and catecholamines were withdrawn and discontinued on day 8. Extensive purpuras in the extremities observed on admission progressed to necrosis of the toes and were treated conservatively. The lesions gradually improved and eventually healed without amputation. Two weeks after admission, *C. canimorsus* was identified in his blood culture samples, and the strain was found to be sensitive to ampicillin and sulbactam. The antibiotics were given for 13 days (figure 5).

OUTCOME AND FOLLOW-UP

On day 52, the patient was ambulatory and was discharged, with residual mild sensory impairment of the legs. When last seen 5 months later, he remained well.

Figure 4 A Giemsa-stained image of a peripheral blood smear showing linear, rod-shaped bacteria phagocytosed by a neutrophil (arrows).

DISCUSSION

C. canimorsus is an anaerobic bacterium found in the oral flora of dogs and cats, and its prevalence is reportedly 26–74% in dogs and 18–54% in cats.¹ Since the first case of human infection in 1976,² approximately 200 cases of *C. canimorsus* infection have been reported worldwide.³ The time to the onset of symptoms after animal contact varies widely from one to eight days.⁴ *C. canimorsus* is weakly pathogenic, but it can cause fatal septicaemia, meningitis, infective endocarditis, DIC, multiorgan failure, shock or a combination thereof, with a death rate as high as 30%. High-risk patients for poor outcomes include alcohol abusers, diabetics, splenectomised subjects and those on immunosuppressive medication; however, healthy subjects can also be affected.^{5–7}

C. canimorsus infection is occasionally associated with purpura fulminans, as in the present case, and amputation may be required in serious cases.⁸ The slow growth of the bacterium in regular culture and residual effects of previous antibiotic treatment often make it difficult to obtain an early definitive diagnosis. Aztreonam, polymyxins and aminoglycosides are reportedly ineffective, and penicillin combined with β -lactamase inhibitors is a first-line choice.^{3,9}

In our patient, septic shock was likely caused by a cat scratch. Although *Pasteurella* infection was a possible differential diagnosis in sepsis following cat scratch or dog bite, this was unlikely because the bacteria found in the peripheral blood smears were Gram-negative rods, which is inconsistent with the morphology of *Pasteurella*. Furthermore, the patient's scratch wound was free from serious swelling or pus discharge, which is also uncommon in local *Pasteurella* infection. These findings strongly suggested *Capnocytophaga* infection^{10–12} and led to an early management strategy. Because *Capnocytophaga* infection is associated with a high death rate, an early therapeutic plan, including intensive treatment, is essential. Therefore, it is important to perform a thorough history taking, to examine the patient for animal scratches or bites and to consider *Capnocytophaga* infection as a differential diagnosis in subjects with septic shock of unknown aetiology.

Figure 5 Clinical course.

Learning points

- ▶ *Capnocytophaga canimorsus* is an anaerobic bacterium frequently encountered in cats and dogs.
- ▶ Itself, *C. canimorsus* is weakly pathogenic, but infection may cause life-threatening complications, especially in immunocompromised subjects, which is associated with a high death rate.
- ▶ Examination of peripheral blood smears is a simple laboratory test that should be performed in patients with septicemia following close animal contact. Early initiation of intensive management is of paramount importance for patients with complications including multiorgan failure and DIC.

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