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Severe Leptospirosis With Diffuse Alveolar Hemorrhage Following Contact With a Sick Dog: A Case Report

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Abstract

Leptospirosis is a zoonotic infection with a broad spectrum of clinical manifestations, ranging from mild self-limiting illness to Weil's disease, its classic severe form. Humans can become infected through exposure to contaminated water or the urine of infected animals, including dogs. Diffuse alveolar hemorrhage is a rare but life-threatening manifestation that may initially present with hemoptysis. A 29-year-old man presented with fever, hemoptysis, anorexia, and asthenia, progressing to acute respiratory distress and jaundice. Two weeks before symptom onset, he had cared for an abandoned dog with a clinical presentation compatible with leptospirosis according to veterinary assessment. The patient's laboratory evaluation revealed anemia, severe thrombocytopenia, acute kidney injury, markedly elevated creatine kinase levels, and increased total and direct bilirubin. Chest CT demonstrated bilateral ground-glass opacities and consolidations. Weil's disease with diffuse alveolar hemorrhage was suspected, and leptospirosis was subsequently confirmed. Hematologic and renal dysfunction improved with conservative management, but progressive respiratory failure required invasive mechanical ventilation for five days. The patient completed a seven-day course of antibiotic therapy with progressive clinical and laboratory improvement. Regarding the dog, veterinary clinicians suspected leptospirosis; however, it died before confirmatory testing. This case underscores the importance of obtaining a thorough animal exposure history in patients presenting with hemoptysis, as early suspicion of leptospirosis is essential for prompt diagnosis and treatment.

Categories: Emergency Medicine, Infectious Disease
Keywords: case report, diffuse alveolar hemorrhage, one-health, severe leptospirosis, weil's disease

Introduction

Leptospirosis is a zoonotic spirochetal infection caused by pathogenic *Leptospira* species. It is most commonly acquired when mucosal surfaces or skin abrasions and wounds come into contact with water or soil contaminated with the urine of infected animals, mainly rodents [1]. Livestock and pets may also become infected and serve as sources of human infection [2,3].

The clinical spectrum is broad, and most infections are asymptomatic or cause a mild febrile illness. However, approximately 10% of cases progress to Weil's disease, the classic severe form of leptospirosis, characterized by multiorgan involvement including acute kidney injury (AKI), jaundice, and hemorrhagic manifestations. Diffuse alveolar hemorrhage (DAH) is a rare but life-threatening complication associated with high mortality [1]. When DAH and AKI occur together, the differential diagnosis with pulmonary-renal syndromes can be challenging [4]. Because laboratory confirmation is often delayed, early recognition depends largely on identifying risk factors, which usually focus on rodent and freshwater exposure, while contact with pets is less often considered.

We report a case of Weil's disease presenting with DAH following close contact with an ill dog, highlighting the value of a thorough epidemiologic history even in the absence of the classic rodent and freshwater exposure history.

Case Presentation

A 29-year-old male with no past medical history besides smoking habits presented to the emergency department (ED) with fever for four days, blood-streaked sputum, malaise, anorexia, and asthenia. At presentation, he denied difficulty breathing, chest pain, rash, or any other symptoms.

Upon physical examination, the patient was clinically stable with no signs of respiratory distress or hemodynamic compromise. Pulmonary and cardiac auscultation was unremarkable. A healing bite wound on the hand was noted, and the patient reported having been bitten by a dog two weeks before symptom onset. As there were no inflammatory signs, it was not considered relevant at that time.

Laboratory evaluation revealed anemia, thrombocytopenia, an elevated international normalized ratio (INR), hyperbilirubinemia, elevated C-reactive protein, and serum creatinine at the upper-normal range (Table *1*). Urinalysis demonstrated proteinuria, hematuria, and leukocyturia. The chest computed tomography (CT) angiography demonstrated bilateral tree-in-bud opacities and multiple ill-defined centrilobular nodules (Figure *1*).

Parameters	Day 4 (ED presentation)	Day 6 (ICU admission)[a, b]	Day 8[b]	Day 9 (intubation/IMV)[c]	Day 13 (extubation)[c]	Reference values
Hemoglobin	12.2	5.6	6.2	8.0	7.3	13.0-18.0 g/dL
Leukocytes	10.88	12.65	9.45	21.39	15.76	4.0-11.0 x 10^9/L
Neutrophils	10.0	12.0	8.8	14.3	12.6	1.3-8.8 x 10^9/L
Lymphocytes	0.4	0.1	2.2	3.0	1.7	1.0-4.8 x 10^9/L
Platelets	66	19	38	195	311	150-400 x 10^9/L
Creatinine	1.2	3.3	2.7	1.3	0.8	0.7-1.3 mg/dL
Creatine kinase[d]	NA	655	NA	NA	1304	30-200 IU/L
Aspartate aminotransferase	57	57	34	63	116	5-34 IU/L
Alanine aminotransferase	81	51	35	54	128	<55 IU/L
Gamma-glutamyl transferase	78	88	57	172	466	<55 IU/L
Alkaline phosphatase	138	116	79	135	315	40-150 IU/L
Total bilirubin	2.6	5.0	6.0	9.7	3.0	0.2-1.2 mg/dL
Direct bilirubin	1.5	3.4	4.6	7.4	2.2	<0.5 mg/dL
C-reactive protein	159.0	166.6	131.9	54.8	51.7	< 5.0 mg/L
INR	1.5	1.5	1.5	1.5	1.3	0.8-1.2

TABLE 1: Evolution of laboratory parameters by day of illness and key clinical events

[a]On Day 6, high-flow oxygen and empirical ceftriaxone were started, followed the next day by a switch to benzylpenicillin upon confirmation of leptospirosis. [b]Red blood cell and platelet transfusions were required from Day 6 to Day 8. [c]IMV was required from Day 9 to Day 13. [d]Creatine kinase was not measured on the initial presentation and was assessed later because of the clinical evolution and suspicion of rhabdomyolysis.

IMV - invasive mechanical ventilation, NA - not available

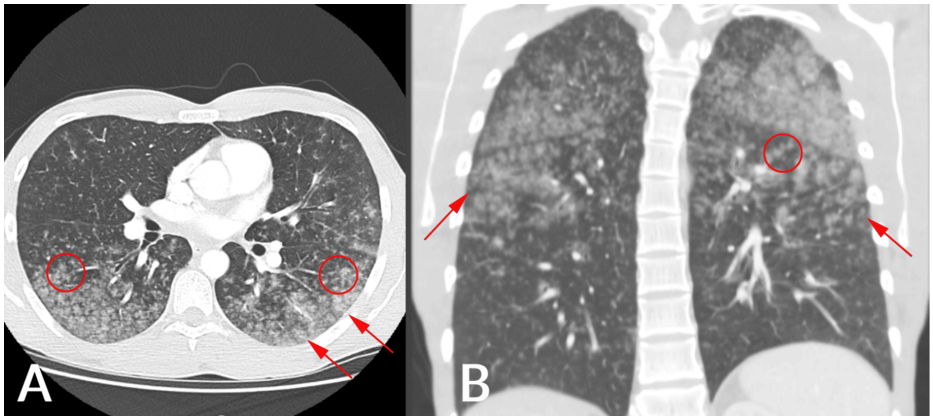

FIGURE 1: CT pulmonary angiography on Day 4 of illness

Axial (A) and coronal (B) images demonstrating bilateral tree-in-bud opacities (circles) and multiple ill-defined centrilobular nodules (arrows).

The patient was kept under observation, and on the sixth day of illness, he deteriorated clinically, with worsening hemoptysis and new-onset jaundice and choluria. Following infectious diseases consultation, a more detailed epidemiologic history was obtained. The patient denied exposure to rodents, freshwater or floodwater, recreational water activities, farming, or occupational risks. He reported having cared for an abandoned, ill newborn dog at home for four days, two weeks prior to symptom onset. This close contact included bathing the animal and handling cloths soiled with its urine, without gloves or other protective equipment. The bite to his hand had been sustained during this period, and no medical attention was sought. The dog was then taken to a veterinary clinic where, according to the patient, its presentation was considered compatible with leptospirosis; however, the dog died before confirmatory testing could be performed.

Due to clinical worsening, the patient was transferred to the intensive care unit (ICU). A non-contrast chest CT scan demonstrated extensive and diffuse peribronchovascular ground-glass opacities and consolidations involving all pulmonary lobes (Figure *2*). Given the clinical context, Weil's disease with kidney failure and DAH was suspected, and empirical ceftriaxone was started. Blood and urine samples were sent for *Leptospira* deoxyribonucleic acid (DNA) detection.

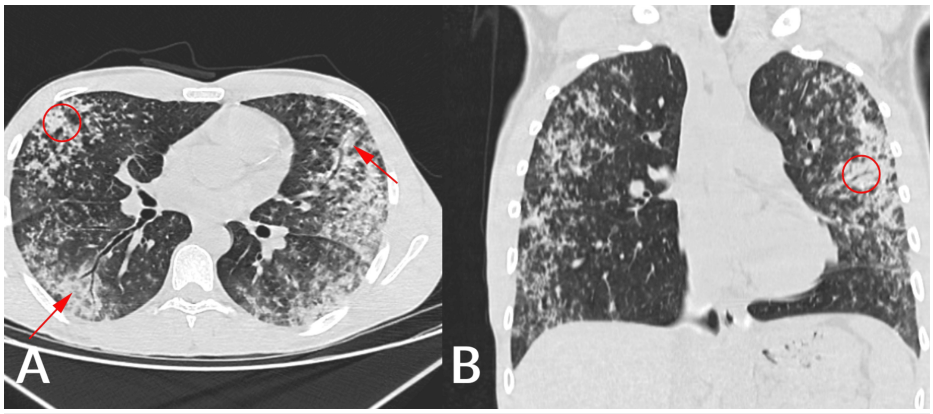

FIGURE 2: Chest CT on Day 6 of illness

Axial (A) and coronal (B) images showing extensive bilateral peribronchovascular ground-glass opacities (arrows) and consolidations (circles) involving all pulmonary lobes, consistent with diffuse alveolar hemorrhage (DAH).

The differential diagnosis of pulmonary-renal syndrome included antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis and anti-glomerular basement membrane disease. Other causes of hemoptysis, such as toxic and structural causes, were evaluated, and intravascular hemolysis was assessed as a possible cause of the anemia.

The workup for alternative causes was negative: autoimmune markers were negative, no toxic exposure to vaping products or cocaine was identified, CT pulmonary angiography demonstrated no cardiovascular

cause of hemoptysis, and markers of intravascular hemolysis were normal.

On the seventh day of illness, leptospirosis was confirmed by detection of *Leptospira* spp. DNA in both blood and urine samples. Ceftriaxone was then switched to benzylpenicillin, which was continued for a total antibiotic course of seven days.

In the ICU, the patient developed conjunctival suffusion with subconjunctival hemorrhage, and there was worsening of anemia and thrombocytopenia, requiring red blood cell and platelet transfusions, which stabilized over the following days. AKI was managed conservatively with fluid therapy according to nephrology consultation and progressively resolved without the need for renal replacement therapy or plasmapheresis. Hemoptysis persisted, and the patient developed progressive respiratory distress. Despite high-flow oxygen therapy, he had poor tolerance to minimal exertion and inadequate ventilatory mechanics, prompting invasive mechanical ventilation (IMV). A chest radiograph following the intubation demonstrated diffuse bilateral opacities (Figure *3*). While intubated, blood clots were aspirated from the airways, consistent with ongoing alveolar hemorrhage until the 10th day of illness. Respiratory function gradually improved, allowing discontinuation of IMV and extubation on Day 13. Hepatic cytolysis, cholestasis, and rhabdomyolysis reached peak values between Days 9 and 13 of illness.

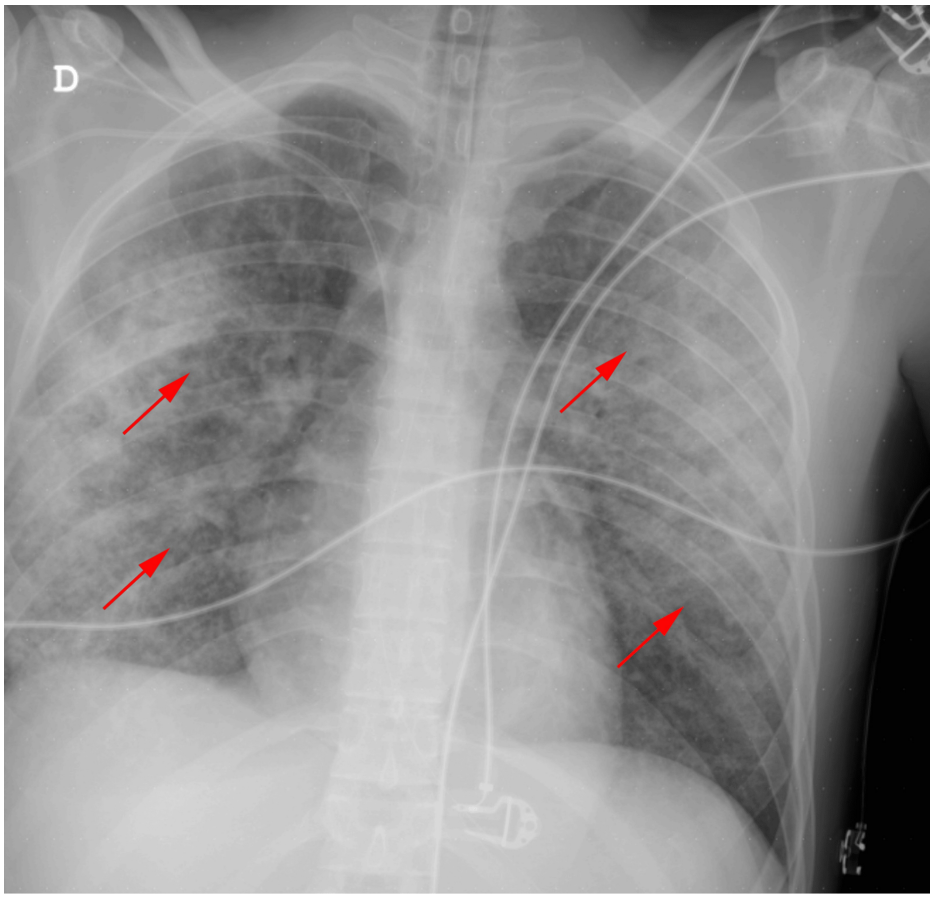

FIGURE 3: Chest radiograph on Day 9 of illness following endotracheal intubation

The arrows indicate the areas of diffuse bilateral pulmonary opacities.

By Day 15 of illness, the patient was transferred from the ICU to the Internal Medicine ward, where he remained under clinical monitoring. Supplemental oxygen was progressively tapered and subsequently discontinued. The patient was discharged on Day 18 of illness.

Discussion

Leptospirosis is estimated to cause approximately 1.03 million cases annually, being among the leading zoonotic causes of morbidity and mortality worldwide [5]. The main reservoirs are rodents, which shed *Leptospira* through the urine, but domestic and agricultural animals can also become infected. Epidemiologic risk factors include inadequate sanitation, travel, rodent infestation, flooding, water-based recreational or

occupational activities, farming, veterinary medicine, and contact with livestock or pets, including dogs [1,3,6]. In this case, severe leptospirosis occurred without classic risk factors, but with a history of exposure to an ill dog and its urine through abraded skin, namely, a bite wound.

Human infection occurs through exposure to contaminated water or soil via skin or mucosal surfaces [1]. *Leptospira* has rarely been detected in rodent saliva [7], and transmission following a rat bite has been described only anecdotally [8]. To our knowledge, similar transmission through animal bite has not been reported in other animal species. However, abraded skin, cutaneous lesions, or wounds are recognized portals of entry when they come into contact with contaminated water or urine [1,2].

This case illustrates a gap between animal and human health services, which is central to the One Health concept. One Health is defined as an integrated approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems, and it relies on communication, coordination, collaboration, and capacity building across sectors [9]. In the present case, the veterinary suspicion of leptospirosis reached the medical team only through the patient's own report upon detailed epidemiologic inquiry. The gap between veterinary and medical care could be narrowed by training veterinary clinicians to inform owners and caregivers of the zoonotic risk and to advise early medical evaluation if symptoms develop. Furthermore, surveillance systems with cross-sector notification could trigger early public health action. Canine vaccination against *Leptospira*, although usually not mandatory, is recommended to prevent infection and carrier status in dogs [10].

Leptospirosis is a common cause of acute undifferentiated febrile illness and is frequently overlooked because of its broad clinical spectrum, ranging from asymptomatic infection to Weil's disease, which occurs in approximately 10% of cases [1]. Early diagnosis relies on a high index of clinical suspicion supported by a thorough epidemiologic history, as laboratory confirmation is often delayed. Therefore, in patients with fever and hemoptysis, leptospirosis should be considered, with diagnostic testing and early empirical antibiotics.

In the present case, fever and hemoptysis were the initial manifestations, followed by the development of diffuse alveolar hemorrhage and AKI, consistent with the severe form of leptospirosis. The combination of diffuse alveolar hemorrhage and AKI prompted consideration of pulmonary-renal syndrome, a clinical entity with a broad differential diagnosis that includes ANCA-associated vasculitis and anti-glomerular basement membrane disease. Distinguishing between these etiologies is essential because management differs substantially [4].

Corticosteroids were neither considered nor administered in the present case. The rationale for immunomodulation is that multiorgan failure in severe leptospirosis may result from host immune overactivation in addition to direct spirochetal injury [1,11,12]. However, a recent Cochrane systematic review of four randomized trials found the evidence insufficient to support or refute the use of corticosteroids, with very low certainty for all outcomes [11]. In an open-label trial of patients with suspected severe leptospirosis and pulmonary involvement, pulse dexamethasone followed by prednisolone did not significantly reduce mortality, duration of bleeding, mechanical ventilation, or hospital stay compared with standard care, and was associated with more nosocomial infections [12]. Despite this evidence, a recent clinical review offers conditional suggestions for corticosteroid use in selected scenarios, such as pulmonary complications, while acknowledging the limited and inconclusive evidence [1]. Whether immunomodulation would have altered the course in this patient cannot be determined from a single case, and adequately powered randomized trials are needed [11].

One significant limitation of the present case is that the diagnosis of leptospirosis in the dog remains presumptive and rests on the veterinary assessment, as neither PCR nor serology could be performed. Consequently, the dog cannot be confirmed as the source of infection, although no alternative exposure was identified on targeted history-taking.

Conclusions

Leptospirosis should be considered in the differential diagnosis of patients with fever and diffuse alveolar hemorrhage. In this case, no classic exposure to rodents or freshwater was identified, but close contact with a sick dog was reported. Although this source could not be confirmed, this case suggests that inquiring about contact with ill domestic animals may help raise early suspicion of leptospirosis, a potentially severe but treatable disease.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

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