

A CLINICAL CASE OF PNEUMONIA INDUCED SEPSIS

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ABSTRACT

The aim of this case report is to present the dynamics of clinical manifestation and treatment of a dog with pneumonia induced sepsis. The patient was with hypothermia, dehydration, dyspnea and signs of disseminated intravascular coagulation syndrome. The laboratory findings included marked leukocytosis, thrombocytopenia and prerenal azotemia. Intense fluid and combined antibiotic therapy was introduced which resulted in a favorable outcome.

Key words: sepsis, pneumonia, dog.

Introduction

Sepsis is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection (Singer et al., 2016). Systemic inflammatory response syndrome (SIRS) is the clinical manifestation of the inflammatory response that occurs as a result of an infectious or non-infectious insult. The diagnostic criteria for SIRS in dogs are extrapolated from human medicine and include the presence of at least three of the following: tachypnea (RR > 40 breaths per minute), tachycardia (HR >120 beats per minute), leukocytosis or leukopenia (WBC >18,000/μl or < 5,000/μl), and fever or hypothermia (T > 40 °C or < 37.5 °C) (Silverstein, 2006). Common infectious foci include peritonitis, pneumonia, pyothorax, and pyelonephritis (Silverstein, 2006). The usual bacteria that cause canine pneumonia are gram negative aerobic rods (80%) such as *E. coli*, *Pseudomonas spp*, *Klebsiella spp*, *Enterobacter spp*, *Pasteurella spp*, and *Bordetella bronchiseptica*. A minority of pneumonia cases culture positive for gram positive aerobic cocci such as *Enterococcus spp*, *Streptococcus spp*, and occasionally *Staphylococcus spp*. The incidence of anaerobic infections in dogs with pneumonia may be up to 20% (King, 2010). The most common abnormalities of the hematological system in sepsis are leukocytosis or leukopenia, anemia, thrombocytopenia and activation of the hemostasis (Goyette et al., 2004). Disseminated intravascular coagulation (DIC) syndrome and leukemoid reaction are possible diagnostic findings which worsen the prognosis (Laforcade et al., 2003; Sakka et al., 2006).

Materials and Methods

Study animal – the object of this study was an 8 years old female, mix breed, stray dog (20 kg body weight). The dog was found on the street in a bad general condition.

Clinical examination was performed through routine techniques.

Hematological and biochemical assays – a blood sample was collected from v. *saphena lateralis* using 20 G needle at day 1 (D1). The CBC was done on Mindray BC-288 Vet automatic blood counting analyzer. Biochemical profile included albumin (ALB), alanine amino transferase (ALT), alkaline phosphatase (AP), creatinin (CREAT) and urea (BUN) levels on semiautomatic analyzer Mindray BA-88A using reagents by Giese Diagnostics, Italy. Several control tests were

initiated in dynamics. Standard blood smear was prepared, stained with Romanovski-Giemsa and observed under immersion with Olympus CX-31.

Immunodiagnostic assay – the used test was *Anigen Rapid CaniV-4Test Kit* (BioNote Inc., South Korea) - a chromatographic immunoassay for the qualitative detection of *Dirofilaria immitis* antigens and antibodies against *Ehrlichia canis*, *Borrelia burgdorferi* and *Anaplasma phagocytophilum/Anaplasma platys*. The test was performed *ex tempore* with whole blood.

Radiographic examination – X-ray projection of the thorax in lateral recumbency (L) was done at D3. The ventrodorsal projection (VD) was skipped because of the patient's dyspnea. Subsequent radiographic exploration in L and VD projection was done at D10.

Ultrasound examination – an abdominal ultrasound and echocardiography was performed at D1 (Mindray SonoScape A5v).

Therapy included licensed veterinary and human drugs in appropriate doses and regiment.

Results

Clinical examination – The clinical examination determined hypothermia (37 °C), dehydration, intense hyperemia of mucous membranes, capillary refill time – 3 s; dyspnea, tachypnea (RR = 63 breaths per minute), bilateral stridor and tachycardia (HR = 143 breaths per minute). The palpation of abdominal cavity was normal. Multiple petechiae and several ecchymoses were found on the abdominal wall skin area.

The body core temperature became in the references range at D2 and from there on the animal was afebrile.

Dyspnea disappeared gradually at D4-D7.

Hematological and biochemical assays – the blood test results at D1 are presented in Table 1.

Table 1: Hematological and biochemical indices at D1

Test	Result	Unit	Reference range dog
WBC	H 50.1	x 10 ⁹ /L	6.0-16.9
LY	3.7	x 10 ⁹ /L	1.1-6.3
Mon	1.0	x 10 ⁹ /L	0-0.84
GR	H 45.4	x 10 ⁹ /L	3.3-12.0
Ly %	L 7.4	%	12-30
Mon %	L 1.9	%	3-10
Gr %	L 90.7	%	60-77
RBC	7.57	x 10 ¹² /L	5.6-8.7
Hgb	H 194	g/L	120-180
Hct	H 57.8	%	37.0-55.0
MCV	73.4	fl	58-79
MCH	25.6	pg	19-28
MCHC	335	g/ L	300-380
Plt	L 109	x 10 ⁹ /L	175-500
Eos %	3.7	%	2-10
ALT	53	U/L	10-90
AP	1919	U/L	23-212
ALB	27.1	g/L	22-39
UREA	35.0	mmol/l	2.2-9.6
CREAT	133.5	μmol/l	44-160

The main hematological alterations included severe leukocytosis because of neutrophilia, increased hemoglobin and hematocrit and thrombocytopenia. There were plenty of segmented

neutrophils without evidence of blast transformation on blood smear. Main biochemical alterations were severely increased BUN and elevated AP activity.

Immunodiagnostic assay – the test was negative.

Radiographic examination – the X-ray image of the thorax in lateral recumbency determined alveolar pattern affecting the cranial and caudal lung lobes. Consolidation was noted in the cranial lung lobe (Fig. 1).



Figure 1: Radiographic appearance of thorax in lateralaral recumbency at D2

Ultrasound examination – normal appearance without free gas or fluid in the abdominal cavity. Echocardiography – relative hypertrophy of left ventricular (LV) parietal myocardium and decreased left atrium (LA) volume due to hypovolemia. Fractional shortening (FS) was within the reference range.

Lavage (endotracheal or bronchoalveolar) was not performed because of the pronounced dyspnea and increased anesthesia hazard.

On the base of the available clinical and laboratory data the **pneumonia induced sepsis** was diagnosed.

The treatment protocol was the following:

- 0.9 % NaCl solution – 20 ml/kg i.v. slow constant rate infusion;
- Ceftriaxone – 30 mg/kg/12 h;
- Heparin – 100 UI/kg/8 h s.c.;

At D2 the renal parameters were in reference range (Creat – 76.4 μ mol/l, BUN – 9.6 mmol/l). At the same time leukocyte count (Fig. 2) was more than twice increased ($129.5 \times 10^9/l$) and also Amikacin – 20 mg/kg/24 h i.v. was introduced. At D3 the platelets count was normal ($192 \times 10^9/l$) and heparin injections were discontinued. The fluid therapy was suspended at D5 when anorexia was resolved.

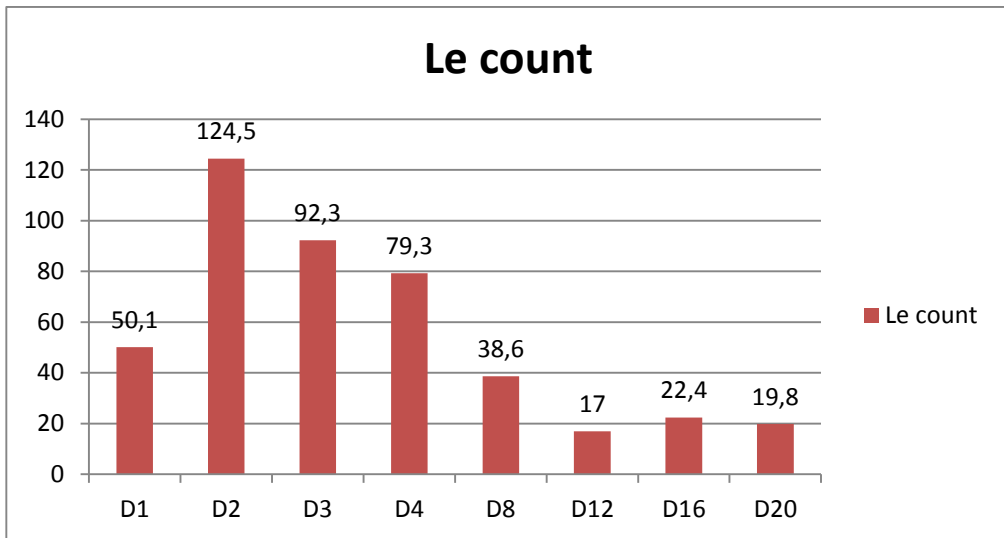


Figure 2: Leukocyte count in dynamics (x 10⁹/L)

In follow-up X ray (D10), alveolar infiltrates are completely resolved. There is a slightly increased diffuse nonstructured interstitial pattern (Fig. 3).



Figure 3: Radiographic appearance of thorax in lateralar recumbency at D10

The clinical outcome was favorable. The intravenous antibiotics were replaced with *per os* formulation (Amoxicillin with clavulonic acid in standard regimen) for 3 more weeks.

Discussion and conclusions

The patient was introduced in worsen clinical status with signs of SIRS and sepsis – leukocytosis, dyspnea, tachypnea and tachycardia, prerenal azothemia, altered hemostasis. Clinical examination and radiography showed the presence of pneumonia probably from bacterial source. Pneumonia is one of the loading factors for development of sepsis in animals and humans (Bewick et al., 2008). Aggravating factors were mild DIC syndrom and development of hyperleukocytosis (leukemoid reaction). Severe nonneoplastic leukocytosis greater than $50 \times 10^9/l$ with normal maturation state of the cells is defined as leukemoid rection (Sakka et al., 2006). Common causes are severe infections, malignancies, intoxication, severe hemorrhage or acute hemolysis. By definition, it is diagnosed by the exclusion of a malignant hematological disorder such as chronic myeloid or chronic neutrophilic leukemia. Elevated alkaline phosphatase which was a part of the laboratory findings is also a characteristic feature of a leukemoid reaction (Udristioiu et al., 2014). As a result of the fluid therapy patients hemodynamics was stabilized and combined antibiotic therapy provided recovery.

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