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Suspected Feline Leukemia Virus (FeLV) in a Domestic Cat: A Case Study

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ABSTRACT

Feline Leukemia Virus (FeLV) is one of the major causes of death in cats. A 4-year-old domestic cat weighing 2 kg presented with decreased appetite, weakness, sneezing, and nasal discharge. Physical examination revealed gingivitis accompanied by ulcers in the mouth and pale mucous membranes. Further diagnostic tests included hematology examination, blood chemistry examination, and the FeLV test kit. The results of hematology and blood chemistry examinations reported that the animal had leukocytosis, neutrophilia, thrombocytopenia, hypochromic macrocytic anemia, hyperproteinemia, hyperglobulinemia, decreased A/G ratio, hyperamylasemia, hyperbilirubinemia, and azotemia. Rapid test (kit) examination showed a positive result for FeLV. Based on the diagnostic results, the initial diagnosis was suspected Feline leukemia virus (FeLV) with an infausta prognosis. The treatment included antibiotics Amoxicillin at 18 mg/kgBW, Diphenhydramine HCl 1 mg/kgBW, Ornipural® 0.2 ml/kgBW, Kenalog® 1 mg/kgBW, Hematovit® dose 0.4 ml/kgBW, and supplements in the form of Vitamin C 0.5 ml/day and Fufang® 1 ml/kgBW. Despite the treatment, the cat's condition did not improve and it succumbed on the sixth day of treatment.

Keywords: Cat, virus, FeLV.

ABSTRAK

Feline Leukemia Virus (FeLV) merupakan salah satu jenis virus yang telah dilaporkan menjadi penyebab utama kematian pada kucing. Seekor kucing lokal berumur 4 tahun dengan bobot 2 kg mengalami penurunan nafsu makan, lemas, bersin dan terdapat leleran pada hidung. Pemeriksaan fisik ditemukan gingivitis disertai ulkus pada mulut dan mukosa pucat. Pemeriksaan lanjutan dilakukan dengan pemeriksaan hematologi, pemeriksaan kimia darah dan tes kit FeLV. Hasil pemeriksaan hematologi dan kimia darah dilaporkan hewan mengalami leukositosis, neutrofilia, trombositopenia, anemia makrositik hipokromik, hiperproteinemia, hiperglobulinemia, penurunan rasio A/G, hiperamilasemia, hiperbilirubinemia dan azotemia. Pemeriksaan KIT menunjukkan hasil positif FeLV. Merujuk dari hasil pemeriksaan penunjang yang didapatkan, maka diagnosis awal dari kasus ini adalah *Suspect* Feline leukemia virus (FeLV) dengan prognosis infausta. Terapi berupa pemberian antibiotik Amoxicilin dosis 18 mg/kgBB, Diphenhydramine HCl 1 mg/kgBB, Ornipural® 0.2 ml/kgBB, Kenalog® 1 mg/kgBB, Hematovit® dosis 0.4 ml/kgBB dan suplemen berupa Vitamin C 0.5 ml/hari dan Fufang® 1 ml/kgBB. Pengobatan yang diberikan tidak menunjukkan progres yang baik sehingga kucing kasus mengalami kematian pada hari ke-6 perawatan.

Kata kunci: Kucing, virus, FeLV.

INTRODUCTION

Viral diseases represent major health issues for domestic cats. Some viruses can lead to a range of health disorders that impact quality of life and may even pose life-threatening risks. Understanding these diseases is essential for effective prevention, diagnosis, and treatment. Various viruses can infect cats and cause different diseases. Some common viruses found in cats include feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), feline herpesvirus (FHV-1), feline calicivirus (FCV), and feline panleukopenia virus (FPV) (Chazar et al., 2019).

The feline leukemia virus (FeLV) is a contagious disease in cats and is the primary cause of mortality in this species. Infected cats may experience anemia, cancer, and a compromised immune system. Levy and Amanda (2020) reported that the prevalence rate of this disease in the United States is approximately 3%. Progressive FeLV infections are prevalent in certain countries, including those in Southeast Asia and Brazil, with rates ranging from 12% to 25%. Recently, a prevalence of 13% was reported in Australia (Westman et al., 2019). FeLV prevalence is relatively high in the general cat population. Contributing risk factors include stray cats, unneutered male cats, and cats suffering from respiratory, oral, or abscess-related conditions (Morishita et al., 2023).

FeLV can be transmitted both vertically (from mother to kitten) and horizontally through saliva, urine, feces, contaminated food containers, bite wounds, and breast milk. The primary source of infection is the likelihood of transmission from mother to kitten (Erbeck et al., 2021). FeLV infection can be detected after two to five weeks. Clinical symptoms vary depending on the cat's immune response. Testing can be performed using polymerase chain reaction (PCR) to detect viral RNA and antibody testing to determine the presence of infection. Cats experiencing progressive infection exhibit the most unfavorable prognosis, with mortality rates reaching as high as 90% within three years due to aplastic anemia and lymphoma. Regressive infection remains inadequately understood. Prevention of FeLV infection includes implementing vaccination programs (Westman et al., 2019). This study reviewed the clinical and supportive examination results, virus detection, and management of FeLV case in domestic cat.

MATERIALS AND METHOD

Signalement and Anamnese

A 4-year-old local cat weighing 2 kg presented with decreased appetite, lethargy, sneezing, nasal discharge, dirty ears, and dental tartar. The cat had a vaccination history for feline panleukopenia, feline rhinotracheitis, feline calicivirus, and chlamydia. The cat was fed wet food.

Physical examination

Physical examination revealed a body weight of 2 kg, temperature of 37.4℃, Heart Rate (HR) of 120 beats per minute, Respiratory Rate (RR) of 36 breaths per minute, Body Condition Score (BCS) 4/9, lethargy, skin turgor >2 seconds, moderate dehydration at 6-7%, pale mucous membranes, and Capillary Refill Time (CRT) 2 seconds.

Supporting examinations

Blood sampling was performed for hematology, blood biochemistry, and FeLV testing. The test kit results showed that the animal was negative for FPV, FCV, and FIV, and positive for FeLV. The hematology and blood chemistry results revealed several abnormalities in the patient, including leukocytosis, neutropenia, thrombocytopenia, macrocytic hypochromic anemia, hyperproteinemia, hyperglobulinemia, decreased A/G ratio, hyperamylasemia, hyperbilirubinemia, and azotemia.

Diagnosis

Preliminary examination results, including physical examination, kit tests, hematology, and blood chemistry tests, indicated that the cat was suspected of having FeLV and had an unfavorable prognosis.

Therapy

The cat was treated with 0.9% NaCl infusion and intramuscular (IM) injections of amoxicillin (Intramox®) at 0.2 mL (0.1 mL/kg BW) and diphenhydramine HCl at 0.2 mL (1 mg/kg BW). Additionally, Kenalog® ointment containing triamcinolone acetonide was applied topically at a dose of 1 mg/kg BW to reduce inflammation and allergic reactions in the oral cavity wounds. Supportive therapy was also administered in the form of Ornipural® 0.2 ml/kg BW IM, Vitamin C 0.5 ml/day subcutaneously (SC), Hematovit® 0.4 ml/kg BW IM, and Fufang® 1 ml/kg BW orally (PO).

RESULTS

Physical examination revealed symptoms of halitosis, gingivitis, and mouth ulcers. Hematology and blood chemistry results indicated abnormalities in the animal, including leukocytosis, neutrophilia,

thrombocytopenia, macrocytic hypochromic anemia, hyperproteinemia, hyperglobulinemia, a decreased A/G ratio, hyperamylasemia, hyperbilirubinemia, and azotemia. The test kit indicated a positive result for FeLV antigen, as evidenced by the appearance of two lines: one in the control area (C) and another in the test area (T).

DISCUSSION

FeLV is a member of the Retroviridae family, a single-stranded RNA virus protected by an envelope. FeLV has a limited survival time outside the host in dry conditions and can be effectively inactivated by disinfectants, detergents, heating, and drying (Westman et al., 2019). Clinical symptoms primarily include immunosuppression and secondary infections leading to tumors and hematological abnormalities. Two groups of retroviruses have been identified in cats: the first group is associated with leukemia, while the second group is endogenous, remaining latent within cells and capable of replication in cell cultures of other species without inducing leukemia (Erbeck et al., 2021). This virus is an exogenous agent that can replicate in many tissues, including bone marrow, salivary glands, and respiratory epithelium. Without an immune response following initial infection, FeLV could disseminate to the bone marrow and infect hematopoietic precursor cells (Hartmann & Hofmann, 2020).

FeLV can be diagnosed through various methods, including the ELISA (Enzyme-Linked Immunosorbent Assay) test, a rapid blood test that detects antibodies against FeLV. A confirmatory Western blot test may be conducted if the ELISA result is positive. This test detects FeLV viral proteins in the blood (Pirbazari et al., 2019). Saliva testing is helpful, especially in cats, where blood sampling is complex. PCR testing is a molecular technique that detects FeLV viral genetic material in blood or other bodily fluids, confirming FeLV infection in the early stages (Westman et al., 2019). The examinations in this case were limited to physical examination, hematology, blood chemistry, and the application of test kits.

The physical examination of cats infected with FeLV typically reveals symptoms including enlarged lymph nodes and skin issues (Buch et al., 2017). The physical examination in this case revealed halitosis accompanied by gingivitis and ulcers in the mouth. Gingivostomatitis frequently occurs in cats infected with retroviruses, particularly in cases of FeLV infections (Silva et al., 2021). The virus is present in the pharynx and spreads to the rostral region, particularly along the upper jaw teeth. The mucosa shows histological infiltration by plasma cells and lymphocytes. The virus induces an inflammatory response that varies in severity. The developing lesions cause pain and may result in tooth loss (Powers et al., 2018). Severe gingivitis and stomatitis may result in anorexia and cause damage to the oral mucosa and gingiva. The immune response suggests chronic antigenic stimulation or immune dysregulation, increasing inflammatory cytokines (Hartmann, 2012).

The hematological examination of the cat's case indicated leukocytosis, neutrophilia, thrombocytopenia, and macrocytic hypochromic anemia. A decrease in the total red blood cell count and an increase in MCV were observed in this case. Anemia results from damage to red blood cells, decreasing the quantity of these cells in the bloodstream (Albab et al., 2022). Macrocytic anemia is observed in non-regenerative anemia resulting from myelodysplasia in cats infected with FeLV (Synkess and Hartman, 2014). A decrease in platelets may result from viral infections that impact precursor cells and diminish megakaryocyte production. Megakaryocytes are large bone marrow cells containing interconnected lobes (Raadsen et al., 2021). Prihirunkit et al. (2008) reported that hematological examinations of FeLV-infected cats revealed leukocytosis, thrombocytopenia, and anemia. Gleich and Hartmann (2009) reported similar findings, indicating that hematological examinations in cats with FeLV infection lacked high specificity. Leukocytosis, thrombocytopenia, and anemia were assessed through multiple case evaluations.

Blood chemistry showed increased total protein, globulin, amylase, bilirubin, BUN, creatinine, and decreased A/G ratio. Hyperproteinemia may be caused by hyperglobulinemia. Elevated globulin levels may

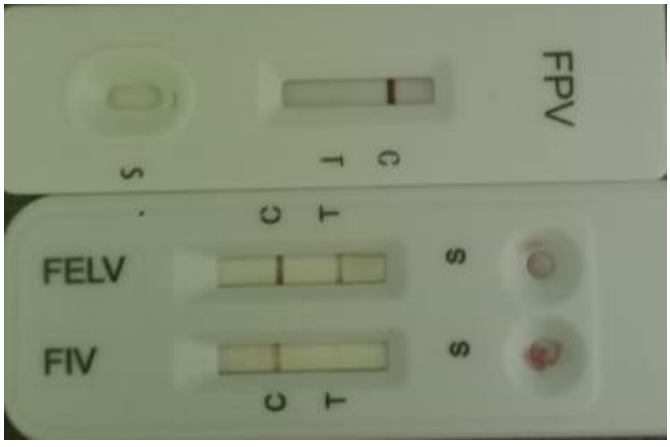

Figure 1. Cat test kit results show a positive result for the presence of FeLV antigen, indicated by two lines appearing, one in the control area (C) and one in the test area (T).

Table 1. Results of hematology and blood biochemistry tests

Examination	Results	Normal Range (Cat)
Hematology		
White Blood Cells (WBC) (103/µL)	20.58	5.5-19.5
Lymphocytes (103/µL)	1.68	1.5-7
Monocytes (103/µL)	1.27	0 -1.5
Neutrophils (103/µL)	17.18	2.5-14.0
Eosinophils (103/µL)	0.44	0-1.5
Basophils (103/µL)	0.02	0- 0.1
Lymphocytes (%)	8.2	12-30
Monocytes (%)	6.2	3.0-10.0
Neutrophils (%)	83.4	35-75
Eosinophils (%)	2.1	2-12
Basophils (%)	0.1	0-1
Red Blood Cells (RBC) (106/µL)	3.18	5 – 10
Hemoglobin (Hb) (g/dL)	5.3	8 – 15
Hematocrit (HCT) (%)	18.7	24 – 45
MCHC (g/dL)	28.1	30 – 36
MCH (Pg)	16.5	12.5 – 17.5
MCV ((fL.)	59	39 – 55
Platelet (PLT) (µL)	159	300-800
MPV (fL)	15.6	12.0-17.0
PChT	0.25	0.0-2.9
PDW (%)	44.3	0.0-50.0
Blood Biochemistry		
ALT/SGPT (U/L)	34	20-100
ALP (U/L)	26	10.0-90.0
TP (g/dL)	9.9	5.4-8.2
Albumin (g/dL)	2.6	2.2-4.4
Globulin (g/dL)	7.2	1.5-5.7
A/G Ratio	0.36	0.6-1.0
Amylase (U/L)	3023	300-1100
Glucose (mg/dL)	103	70-150
Total Bilirubin	4.8	0.1-0.6
BUN (mg/dL)	80	10.0-30.0
Creatinine (mg/dL)	2.7	0.3-2.1
Calcium (mg/dL)	9.3	8.0-11.8
Phosphorus (mg/dL)	6.1	3.4-8.5
Na^+ (Sodium) (mmol/L)	152	142-165
K+ (Potassium) (mmol/L)	4.0	3.7-5.8

Explanation: Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Hemoglobin Concentration (MCHC), Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Alkaline Phosphatase (ALP), Serum Glutamic Pyruvic Transaminase (SGPT), Total Protein (TP), Blood Urea Nitrogen (BUN).

arise from infectious diseases, as antigens in the body stimulate the production of immunoglobulins (Pare et al., 2022). Elevated total protein levels can result from dehydration, chronic inflammation, and viral infections (Hermawan and Restijono, 2021). Elevated BUN and creatinine levels at 80 mg/dL and 2.7 mg/dL, respectively, indicate kidney involvement in the spread of infection. The creatinine results suggest that the

kidneys may be undergoing chronic kidney failure at a mild to moderate stage, indicated by values ranging from 1.6 to 2.8 mg/dL (IRIS, 2023). This is supported by Rossi et al. (2019), who stated that blood biochemical test results in FeLV cases can indicate involvement of multiple organs, such as the liver, immune system (lymphoid), pancreas, and bone marrow, as evidenced by abnormal levels of total protein, globulin, amylase, and total bilirubin.

The treatment given to cats infected with FeLV involved evaluating and treating infections that may affect patients with immunodeficiency and administering immunostimulants. Antibiotics might be utilized as a preventive measure against opportunistic pathogens and secondary infections. The antibiotics administered were amoxicillin, which is bactericidal and has a broad spectrum, making it effective against Gram-positive and Gram-negative bacteria. It demonstrates efficacy compared to penicillin and penicillin V (Kaur et al., 2011). Antibiotics administered to cats infected with the virus to prevent secondary infections include amoxiclav (amoxicillin and clavulanate) (Silva et al., 2018), doxycycline (Lehmann et al., 2022), and cefotaxime (Weingartner et al., 2021). These are broad-spectrum antibiotics effective against both gram-negative and gram-positive bacteria. Diphenhydramine HCl was administered as an antihistamine to treat nasal discharge. Diphenhydramine HCl is an H1 antihistamine utilized for its anxiolytic and sedative properties (Travi, 2022).

Kenalog® ointment was applied twice a day for 5 days. It contains Triamcinolone acetonide, a type of corticosteroid that functions as an anti-inflammatory and anti-allergic agent for irritated wounds in the oral cavity (Haidary et al., 2021). Animals diagnosed with gingivostomatitis may receive oral treatment using Oxyfresh water additive mixed with water, alongside Oxyfresh gel applied topically. This approach aids in managing red and itchy skin, preventing and slowing the development of dental tartar, and addressing gum infections and canker sores (Dewanti et al., 2023). Supportive therapy included the administration of Ornipural®, Vitamin C, Hematovit®, and Fufang®. Ornipural® therapy serves as a stimulant for hepatodigestive function in instances of digestive disorders and kidney failure. Ornipural® is an injectable supplement used to treat kidney failure. Some key components, such as betaine, arginine, ornithine, citrulline, sorbitol, and metacresol, are reported to help improve kidney health (Okle et al., 2022). Hematovit® functions to stimulate red blood cell formation. The administration of vitamin C and Fufang® in this case enhanced the immune system and acted as an antioxidant against oxidative stress within the body, forming free radical bonds with unstable atomic charges (Zhang et al., 2021). Supportive therapy for cats infected with the virus includes the administration of Transfer Factor (TF), which contains Insulin-Like Growth Factor (IGF-1). This factor identifies cell growth receptors and enhances the number and activity of Natural Killer (NK) cells, allowing them to combat various pathogens effectively (Dewanti et al., 2023). The administration of multivitamins, including vitamins A, C, D, E, K, and B complex, may aid in preventing tissue damage and improving the immune system in affected animals (Hartono et al., 2022).

The results of the six-day inpatient treatment did not demonstrate significant improvement. The cat in question died on the sixth day of treatment. Currently, there is no ideal treatment for managing FeLV infection; several antiviral agents to treat leukemia in cats remain in the experimental phase. There is no effective treatment for myeloproliferative leukemia (bone marrow) (Hartmann, 2015). Therapy is supportive and may require blood transfusions in cats with anemia. Immunosuppressive corticosteroids should typically be avoided. Antibiotics from the tetracycline group, such as doxycycline, may be used if secondary bacterial infections occur. If stomatitis or gingivitis is present, corticosteroids such as prednisone and anabolic steroids may be considered as treatment options (Synkess & Hartman, 2014).

This case study concludes that FeLV diagnosis was achieved through a comprehensive analysis of anamnesis, clinical symptoms, physical examination, hematology, blood chemistry, and test kits, supplemented by laboratory tests for a definitive diagnosis. Currently, the management of FeLV cases primarily concentrates on symptom treatment and prolonging the animal's life.

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