Feline Immunodeficiency Virus Infections Associated with Slow Healing Wounds: A Case Study

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abstract

Feline Immunodeficiency Virus (FIV) is an infectious disease transmitted by saliva or blood. Transmission by bite wounds puts stray cats at high risk for FIV. This case report aims to describe FIV infection and highlight the value of testing for FIV, particularly in stray cats. The patient is a domestic short-haired cat, male, ±2 years old, and a stray. He had recently been found by the client, who intended to take him home. His initial symptoms were having a wound in his ear flap, sneezing with mucus nasal discharge, and pale mucosa. The cat had a physical examination, hematological test, testing with the FIV-FeLV test kit, and blood chemistry test. The cat was seropositive for FIV, anemia, thrombocytopenia, and cholestasis. The cat was hospitalized, and the treatment given were doxycycline, acetylcysteine, Sangobion, albumin, Fufang E'jiao Jiang (FEJ), human-erythropoietin injection, Transfer Factor, and LiverRx. His condition worsened after 40 days, and unfortunately, he died on his 51st day at the clinic.

Keywords: FIV, immunodeficiency, transmissions, stray cats

Introduction

Feline Immunodeficiency Virus (FIV) belongs to the Lentivirus genus and the family Retroviridae. It specifically infects the cat family. FIV is a common infectious disease of cats worldwide, it is frequently undiagnosed due to its wide range of symptoms. Rhinitis, conjunctivitis, gingivitis, stomatitis, persistent diarrhea, chronic or nonresponsive infections of the external ear and skin, ocular disease, and neurological abnormalities can be found on the physical examination of FIV-infected cats (Tilley et al., 2021). Because FIV increases the risk of immune dysfunction that can lead to immunodeficiency, the host will become more susceptible to opportunist infections, such as bacterial, viral, protozoal, and parasitic infections (Ettinger et al., 2017).

FIV infection has three main phases of infection: primary, subclinical, and clinical. The primary phase happens after the inoculation of the virus; the virus replicates rapidly, and viremia is detectable through polymerase chain reaction (PCR). Next, the cat will enter the subclinical phase, which can last for several years and can be asymptomatic. In this phase, there are low levels of viremia and high production of FIV antibodies. Following the subclinical phase, the cats may continue to the clinical phase. Functional immunodeficiency may develop in this phase resulting in an increased risk of secondary infections, neoplasia, or immune-mediated disease (Ettinger et al., 2017; Westman et al., 2022).

FIV is transmitted directly by saliva or blood and can occur from bite wounds, blood transfusions, or even surgical equipment. Vertical transmissions between a kitten and their mother can also happen prenatally (in - utero) or postnatally (contaminated breast milk) (Westman et al., 2022). Free-roaming cats are at high risk for FIV infection and represent an important source of new infections (Ettinger et al., 2017). Competitive behaviors over food or territory can result in fights and increase the possibility of them getting wounded. Any of these could be the point of FIV transmission among stray cats.

The issues related to the high population of stray cats started to be recognized in Indonesia. The action taken is shown in many forms, such as a trap-neuter-return (TNR) program as population control or even the adoption of stray cats. Checking for FIV is a step that should be considered before adopting stray cats since FIV can be transmitted through saliva to another cat at home and the infection is persistent. The purpose of this case study is to describe more about FIV infection cases in cats, specifically a stray cat, and also to highlight the importance of diagnosing FIV in stray cats before adopting them at home.

Materials and Methods

This case study took place at Amore Animal Clinic, BSD, South Tangerang. The examination starts with a physical examination by assessing the cat's general conditions, body weight, body temperature, and hydration status, also checking the cat's body conditions systematically. Diagnostic testing in this case included a complete blood count (hematology), a FIV-FeLV test kit (Shenzhen Zhenrui Biotech Co., Ltd.), and a blood chemistry test, which were performed from the cat's departure until his last time.

Results and Discussions

Anamnesis and Physical Examination

A male, domestic short-haired cat, with an estimated age around 2 years and unneutered was brought to the clinic with an open wound in his right ear flap. The client had recently found the cat on the street and had taken him straight to the clinic. Since the client had recently found him on the streets, there were no medical records. His condition was quite responsive and alert, body temperature slightly high 39.5oC, body weight of 3.6 kg, normal hydration status, present with mucus nasal discharge, and his mucous membrane (gingiva, conjunctiva, nasal plane) looked pale.

Laboratory Tests and Treatments

A hematological test was being performed to identify anemia because the cat looks pale and has no medical history. It showed that the cat had anemia and thrombocytopenia; low total red blood cells/RBC (4.05x106/µl), low hemoglobin/HGB (7.3 g/dL), low hematocrit/HCT (22.2%) and low thrombocyte/PLT (39x103/µl). The cat was hospitalized, and under observations of the vets and paramedics. Treatment starts with antibiotic (doxycycline dose: 10 mg/kg) combined with mucolytic (acetylcysteine: dose 12 mg/kg) 2 times a day orally, to relieve the upper respiratory and skin infection, also combined with albumin for the wound healing. The cat also received the blood supplement with Sangobion™ (P&G Health), Fufang E'jiao Jiang (FEJ), human-erythropoietin injection (Hemapo-Epoetin Alfa™, Kalbe) (dose: 100 IU/kg) every 2 days to help with the anemia. The wound on the ear flap was treated with an ntibiotic ointment (Enbatic™, Erela) that contains Bacitracin zinc and neomycin sulfate. The cat's appetite turned out to be good, and no signs of dehydration. After 10 days, there was some improvement in the wound; although it hasn't completely healed, the size is slightly smaller (Fig. 2B). The symptoms of upper respiratory infections, like frequent sneezes and nasal discharge, have not improved throughout the course of treatment.

The 2nd hematology test was conducted on his 12th days hospitalized, and the result showed that the cat had a low total number of WBC/leukopenia (4.1x103/µl), RBC had reached the normal range (4.92x106/µl), modest increase in hemoglobin/HGB (8.9 g/dL), HCT (26.5%), and PLT (59x103/µl), although they were still below the standards. This indicates that the cat's anemia and thrombocytopenia persist. Based on the hematology results, there were indications of Feline Immunodeficiency Virus (FIV) or Feline Leukemia Virus (FeLV), and the owner is being offered to check with the FIV-FeLV test kit. The indication came from the RBC result, which showed leukopenia, anemia, and thrombocytopenia, as well as from the cat's conditions, which showed slow progress in the treatment. The owner agreed to check with the FIV/FeLV test kit (Shenzhen Zhenrui Biotech Co., Ltd) and the result was that the cat was seropositive for FIV and negative for FeLV (Fig. 1).

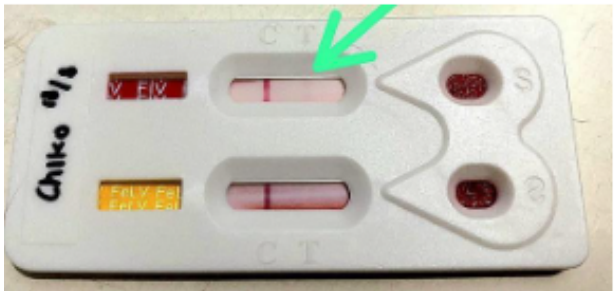

Fig. 1 The FIV-FeLV test kit result shows the cat seropositive for FIV

Immunomodulator was added to the treatments by giving the cat 4 Life Transfer Factor Tri-Factor/TF™ (Maxcure Nutravedics Ltd.) one capsule a day. The cat is also being isolated from another cat to prevent transmissions from saliva. Mucolytic, albumin, Sangobion™, FEJ, and continuous human-erythropoietin injection were all part of the cat's continued treatment. Bioplacenton™ (KalbeMed) was given as an additional topical treatment.

The wound made some progress a month later, but it still hadn't healed completely (**Fig. 2C**). There has been some improvement in the symptoms of upper respiratory infection as well; sneezing has become less frequent, and the nasal discharge has changed from being serous to being seromucous. But the cat now appears jaundiced and has lost weight to 2.9 kg, despite the fact that his appetite was usually good previously.

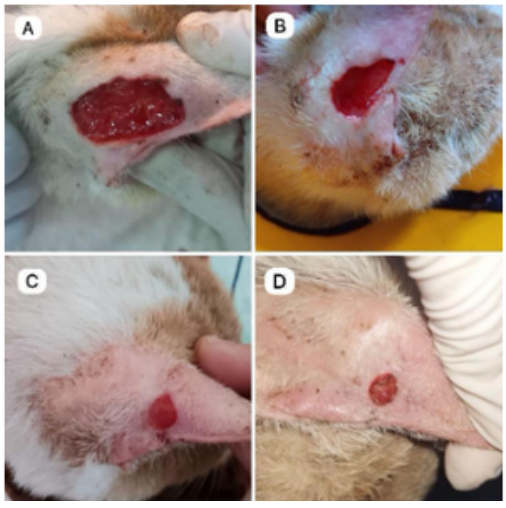

Fig 2. The wound in the cat's ear flap (A) On his 1st day at the clinic (B) On his 10th day (C) On his 42nd day, and (D) On his 50th day.

A comprehensive blood chemistry test was being performed to identify the cause of jaundice and the results of the tests were: hyperproteinemia (8.6 g/dl), hyperbilirubinemia (4.4 mg/dl), hypercholesterol (183 mg/dl), high alanine transaminase/ALT (113 U/l), gamma-glutamyl transpeptidase/GGT, and alkaline phosphatase/ALP were normal, low creatinine/CRE (0.69 mg/dl), and normal blood urea nitrogen/BUN (28/7mg/dl). This result indicates that the cat had cholestasis.

Treatment plan added with LiverRx (LiverRx™) one capsule a day as liver supplement. The food also changed into hepatic-specialized food (Happy Cat VET Diet Hepatic Dry). Unfortunately, the cat's health has gotten worse ever since, and he passed away a week later on his 51st day at the clinic.

Discussions and Limitations

Since the first day of being hospitalized, the cat has been receiving doxycycline combined with acetylcysteine and albumin. Doxycycline can be the first choice when treating felines' upper respiratory infections (Tilley et al., 2021). Meanwhile, acetylcysteine is used as mucolytic because of its character which decreases the viscosity of bronchial secretions (BSAVA, 2020). Albumin can also contribute to accelerating the wound - healing process (Utariani et al., 2020). Given that the cat's hematological test result revealed that the cat was anemic, the cat was also given blood supplements (Sangobion, P&G Health) which contains folic acid, ferrous gluconate, copper sulfate, vitamin C, and vitamins B12 and B6. Ferrous gluconate can be used as an iron supplementation as the specific therapy for anemic cats. FEJ is a Chinese herbal medicine that can be used as a supplement to anemic cats, because it contains Colla corii Asini that has hematopoietic effects (Sewoyo & Purwitasari, 2023). The cat also received an injection of human erythropoetin (Hemapo-Epoetin Alfa, Kalbe) with a dose 100 IU every 2 days. Human erythropoietin can be used as an erythropoiesis-stimulating agent in cats. No increase in viral load was reported in cats with FIV that received human erythropietin. This injection is recommended to be given three times a week, with a tapering dose given twice weekly as maintenance therapy that can be used when Packed Cell Volume (PCV) has attained 30-40% as the target (Olson & Hohenhaus, 2019). The antibiotic ointment (Enbatic) used for topical treatment contains bacitracin zinc and neomycin sulfate, both of which have broad-spectrum antimicrobial activity and are the most commonly used topical antimicrobials (Mickelson et al., 2016).

A second hematological test was performed after twelve days of treatment. The results showed leukopenia, normal RBC, low HGB, low HCT, and low PLT. The cat is being tested using a FIV-FeLV test kit (Shenzhen Zhenrui Biotech Co., Ltd) since there were indications of FIV-FeLV. The result is the cat seropositive for FIV. Literature (Skyes, 2014) states that leukopenia and neutropenia were more likely to present in FIV-infected cats, another common abnormalities of CBC in cats infected with FIV include mild anemia, lymphopenia, neutropenia, thrombocytopenia, thrombocytosis, and monocytopenia. This also supports the statement from Westman et al. (2022) that abnormalities of hematology shown on FIV or FELV-infected cats might be leukopenia and anemia. The American Association of Feline Practitioners (AAFP) (Little et al., 2020) recommends doing additional testing on seropositive cats especially in low-risk cats, but in some high-risk cats such as free-roaming, male cats with seroposite FIV test results that are consistent with the cat's clinical signs may not require additional testing.

After being known to be seropositive for FIV, the cat started receiving 4 Life Transfer Factor Tri-Factor/TF (Maxcure Nutravedics Ltd.) one capsule a day as an immunomodulator. TF contains colostrum ultrafiltrate, colostrum nanofiltrate, also egg yolk. Research done by Vetvicka and Vetvickova (2020) states that in addition to stimulating cellular immunity, transfer factors have an impact on the humoral branch and can be employed as natural immunomodulators. The colostrum and egg yolk from TF have a significant immunostimulating capacity. Bioplacenton (KalbeMed) was also added to the topical treatment. Bioplacenton contains neomycin and placental extract. Placental extract can promote the formation of new tissue and the healing of wounds (Wahyuningsih et al., 2021).

After a month, the cat has lost weight and appears more jaundiced, therefore a comprehensive blood chemistry test is being performed. The results were hyperproteinemia, hyperbilirubinemia, hypercholestherol, high ALT, normal GGT, and ALP. Hyperproteinemia can occur in FIV-infected cats from increased γ-globulin concentrations as the result of hyperactivation of B cells in the subclinical phase of FIV infection (Skyes, 2014). High ALT indicates liver failure from injury or necrosis of hepatocytes (Villalba & Sanchez, 2019) or other non - specified hepatobiliary disease (Otte et al., 2017) while high cholesterol and high bilirubin can indicate cholestasis (Villalba & Sanchez, 2019). It is possible that the cat had cholestasis based on these findings.

Cholestasis is defined as an impairment of bile flow from the liver to the duodenum (Park et al., 2018). Cholestasis comes in two forms: extrahepatic and intrahepatic. The degeneration of bile ductuli and hepatic fibrosis resulting from cholangitis or some drugs that impair bile flow at the canalicular level are associated with intrahepatic cholestasis. On the other hand, pancreatitis, biliary neoplasia, choleliths, bile sludge, and decreased gallbladder contractility can all result in extrahepatic cholestasis. The clinical signs include anorexia, weight loss, and icterus (Otte et al., 2017). The immunosuppressive effects of FIV itself can result in neoplasia (Skyes, 2014).

Liver supplements given were LiverRx (LiverRx™) which contains S-adenosyl methionine (SAMe), silybin, vitamin E, and vitamin C. SAMe reduces liver damage and could improve liver function. Silybin is a form of silymarin and has immunomodulatory, anti-inflammatory, regenerative choleretic, and hepatoprotective actions (Marchegiani et al., 2020).

To summarize, the cat is seropositive for FIV, and its clinical signs include slow-healing wounds that represent chronic skin infections, upper respiratory infections and anemia. A month after the treatment, the cat's blood chemistry testing revealed cholestasis, which may have resulted from FIV-related neoplastic diseases. Unfortunately, because of the client's financial limitations, there are no more diagnostic tests—such as an x-ray or ultrasound—to confirm the causes of cholestasis. It's possible that the cat passed away when his liver issues (cholestasis) became worse. The immunosuppressive conditions caused by FIV slower the recovery progress of his current conditions and it may be too late to discover the liver issues. As soon as the cat tested positive for FIV, the client was informed of the prognosis. FIV-positive cats are still highly susceptible to infection, which could impact their recovery progress even if they may live as long as uninfected cats under the right care.

Conclusions

Feline Immunodeficiency Virus (FIV) can result in immunodeficiency or immunosuppression in cats, which can have a systemic impact on the body and manifest in variety of symptoms, including persistent skin infections, upper respiratory infections and even neoplastic diseases. Due to the high risk of FIV in stray cats, diagnosing it is beneficial in many parts, including for medical records, health care management, preventing the transmission to other cats, prognosticating current infections, determine potential recurrent infections, and even determine the potential to develop another immune-mediated syndrome in the future.

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