A Comprehensive Case Study on Feline Infectious Peritonitis: Diagnosis, Treatment, and Clinical Outcomes in an 8-Month-Old Persian Cat

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Abstract

This case report details the diagnosis and treatment of Feline Infectious Peritonitis (FIP) in an 8-month-old Persian cat treated at the Teaching and Training Pet Hospital and Research Centre (TTPHRC) in Bangladesh. FIP, caused by a mutation in feline coronavirus (FCoV), is a severe and often fatal disease that appears in effusive (wet) or non-effusive (dry) forms. The cat exhibited wet form symptoms, including abdominal distension, mild jaundice, and systemic inflammation, confirmed through clinical exams, blood tests, imaging, and serological tools like the Rivalta and FASTest FIP tests. Key findings included a low albumin-to-globulin ratio and fluid in the abdomen and chest. Treatment with GS-441524, an antiviral considered the gold standard for FIP, alongside antibiotics, corticosteroids, and liver support, led to marked improvement within three weeks, with reduced abdominal fluid, weight gain, and increased activity. This case highlights the life-saving potential of GS-441524 and underscores the need for early diagnosis, comprehensive care, and further research to enhance FIP management.

Keywords: Feline Infectious Peritonitis (FIP), feline coronavirus (FCoV), GS-441524, antiviral therapy, effusive form, wet FIP, albumin-to-globulin ratio, abdominal distension, systemic inflammation, multidisciplinary approach, diagnosis, treatment, research.

Introduction

Feline infectious peritonitis is a severe deadly viral disease of cats and its one of the most common viral diseases of cats found across the world. It is an immune-mediated disease and the causal agent is feline coronavirus (FCoV) which belongs to the family Coronaviridae, a group of enveloped positive-stranded RNA viruses (Hartmann, 2005). The transmission of FCoV is widespread, particularly in multi-cat environments such as catteries and shelters, where up to 80-90% of cats may carry the virus (Hartmann, 2005). Transmission is mainly through ingestion of feces or contaminated litter.In most cases infected cats show mild gastrointestinal symptoms while some infected cats are entirely asymptomatic. Mortality is high when infected cats show clinical symptoms. FIP develops when a mutated virus triggers a harmful immune response, allowing it to replicate in macrophages and cause severe inflammation throughout the body (Pedersen, 2014; Kipar & Meli, 2014).

Clinically, FIP manifests in two distinct forms. One is wet or effusive form and another one is dry or non-effusive form. The effusive or "wet" form is characterized by the accumulation of high-protein exudates in body cavities such as the abdomen, chest leading to noticeable abdominal swelling, breathing problems, and potentially fluid around the heart (Hartmann, 2005). The prognosis of this form is poor as this form progresses rapidly. The less common "dry" form of FIP involves the formation of inflammatory lesions in various organs, including the liver, kidneys, lymph nodes, eyes, and brain (Kipar & Meli, 2014). This form can cause a wide range of symptoms depending on the organs affected, making diagnosis challenging. Unfortunately, both forms of FIP are often fatal, emphasizing the importance of early detection and treatment.

The epidemiology of FIP is impacted by various elements such as genetic predisposition, immune function, stress, age, and living environment. Younger cats, particularly those under 2 years old, and those with weakened immune systems, are at an increased risk of FIP following FCoV exposure (Addie et al., 2009). Moreover, certain purebred breeds, such as Persians, display a genetic susceptibility that may affect their immune response and viral replication dynamics (Addie et al., 2009; Felten & Hartmann, 2019). High-stress conditions, including breeding environments,

overcrowding, and the frequent addition of new cats, heighten disease progression risk and sustain FCoV within cat populations.

Materials and Methods

2.1 Study area:

The study was conducted at the Teaching and Training Pet Hospital and Research Centre (TTPHRC) during my internship placement, which took place from October 22 to November 5, 2024. The Teaching and Training Pet Hospital and Research Centre (TTPHRC) is the first veterinary hospital in Bangladesh exclusively specialized in small animal medicine and surgery. It was established by Chattogram Veterinary and Animal Sciences University in 2018.

The hospital provides hands-on training for intern students and postgraduate veterinary doctors. It offers a wide range of specialized services, including surgery, internal medicine, orthopedics, radiology, gynecology, obstetrics, imaging, and vaccination units. Occasionally, exotic animals also receive treatment here.

2.2 Data and information collection:

After initial registration and history taking, each case was subjected to a detailed clinical examination. Clinico-epidemiological data were systematically recorded on a structured record-keeping sheet. Information collected included the address, date, total population, housing system, species, breed, age, sex, body weight, body condition score (BCS), vaccination and de-worming status, history of previous diseases and treatments, duration of illness, and observations on defecation, urination, and vomiting. Client demographic details (age, sex, education, and occupation) were also noted. Vital signs such as pulse, respiration, and rectal temperature were measured, and clinical assessments included skin fold tests, mucous membrane examination, and evaluation of various organs through palpation, percussion, and auscultation. Additionally, diagnoses and prescribed treatments were documented, including drug trade names, primary and supportive medications, dosage, administration route, and duration of treatment.

2.3 Case presentation

A persian long hair male cat which was aged 8months and weighing around 4 kg was brought in TTPHRC with a history of abdominal distension, mild diarrhoea, dullness, anorexia and weight loss for a period of 3days. The cat's temperature was 102.1° Fahrenheit. The heart rates were found

145 beats per minute and respiration rate was 35 per minute. The cat was weak and dehydrated and couldn't move easily as the abdomen was highly distended because of fluid accumulation. The mucus membrane of the cat was slightly yellowish and also the skin of the extremities was slightly yellow upon clinical examination. An x-ray was taken and the cat was examined for complete blood count (CBC) and serum biochemistry and recommended for detection of antibodies against the feline coronoavirus using FASTest FIP and Revalta test. The owner was also advised to perform ultrasonogram of the cat to detect acities.

2.4 Diagnosis

The initial diagnosis was made based general clinical examination. On general clinical examination the cat showed abdominal distension, pleural effusion and mild jaundice signs which helped us suspect the disease. CBC, serum biochemistry, albumin and globulin level, albumin-globulin ratio are considered classic indirect tests for FIP (Addie et al., 2009; Pedersen, 2009; Drechsler et al., 2011). For more confirmatory diagnosis, complete blood count, serum biochemistry, ultrasonogram, x-ray, fastest fip kit test and rivalta test were done.

The test results of Complete blood count (CBC) and serum biochemistry are mentioned below in Table 1 and Table 2. A complete blood count test (CBC) showed decreased hemoglobin level which was 11.3 g/dl and which is below the normal reference range of 12.0 - 15.5 g/dl. This suggests possible anemia. Also RDW-CV (Red Cell Distribution Width - Coefficient of Variation) value of 23.8% is slightly higher than the reference range (15.0 - 22.0%), which can indicate increased variability in red blood cell size, possibly referring to regenerative anemia or other erythrocyte disorders. These findings are consistent with FIP which often triggers systemic inflammation and mild to moderate changes in hematological parameters.

A serum biochemistry test revealed low albumin globulin Ratio. The ratio is 0.49, which is below the normal range of 0.6 - 1.6. A decreased ratio is often indicative of hyperglobulinemia relative to albumin, which is commonly seen in inflammatory or infectious conditions, such as Feline Infectious Peritonitis (FIP). The test result also shows marginally high markers of liver enzyme activity which is indicative of probable liver problem.

Table 1: Complete Blood Count (CBC) Results of the Cat Examined at the Teaching and Training Pet Hospital and Research Center

Test Name	Result	Reference Value	Remarks
Hemoglobin (Hb%)	11.3 g/dl	9.0 – 15.0 g/dl	Mild decrease, suggesting possible anemia
RBC Count	7.80 m/ul	5.0 – 10.0 million/µl	Normal RBC count
HCT / PCV	31.4 %	30.0 – 45.0 %	Normal PCV level
MCV	40.3 fL	39.0 – 52.0 fL	Normal red cell size
MCH	14.5 pg	13.0 – 17.0 pg	Normal hemoglobin content per cell
MCHC	36.6 g/dl	30.0 – 36.0 g/dl	High-normal hemoglobin concentration
RDW_CV	23.8 %	15.0 – 22.0 %	Slightly high, indicating mild anisocytosis
Total WBC Count	16,400 /cumm	5,500 – 19,500 /µl	Normal WBC count
Neutrophils	49 %	35 – 75 %	Normal proportion
Lymphocytes	44 %	20 – 55 %	High-normal lymphocyte count
Monocytes	04 %	1 – 4 %	Normal monocyte count
Eosinophil's	03 %	2 – 10 %	Normal eosinophil proportion
Basophils	0 %	0 – 1 %	Normal basophil count
Eosinophil's Count	492 /cumm	100 – 1,500 /µl	Slightly elevated, within acceptable limits

Absolute Neutrophils (NEU)**	10^9/L	2.5 – 12.5 x 10^9/L	Normal absolute neutrophil count
Absolute Lymphocytes (LYM)**	10^9/L	1.5 – 7.0 x 10^9/L	Normal absolute lymphocyte count
Platelet Count	1,67,000 /cumm	150,000 – 500,000 /µl	Normal platelet count
MPV	14.1 fL	8.0 – 15.0 fL	Slightly elevated, suggesting larger platelets
PCT	0.235 %	0.1 – 0.5 %	Normal plateletcrit
Absolute Neutrophils (NEU)**	10^9/L	2.5 – 12.5 x 10^9/L	Normal absolute neutrophil count

Table 2: Results of Serum Biochemistry of the cat presented to Teaching and Training Pet Hospital and Research Center

Parameters	Test Results	Reference Value	Remarks
Calcium	10.2 mg/dl	8.5 – 10.5 mg/dl	Normal calcium level
Phosphorus	4.8 mg/dl	2.5 – 6.0 mg/dl	Normal phosphorus level
Magnesium	2.1 mg/dl	1.5 – 2.7 mg/dl	Normal magnesium level
Potassium	4.7 mEq/L	3.5 – 5.5 mEq/L	Normal potassium level
Sodium	145 mEq/L	145 – 155 mEq/L	Normal sodium level

Chloride	105 mEq/L	100 – 120 mEq/L	Normal chloride level
Glucose	74 mg/dl	60 – 120 mg/dl	Normal glucose level
Total Protein	5.8 g/dl	6.0 – 8.0 g/dl	Normal protein level
Albumin	2.42 g/dl	2.5 – 3.5 g/dl	Low-normal albumin level
Globulin	4.98 g/dl	3.0 – 5.0 g/dl	High-normal globulin level, indicating immune activity
Albumin Globulin Ratio	0.49	>0.8	Decreased, suggesting chronic inflammation or immune activation
Bilirubin	1.6 mg/dl	0.1 – 0.4 mg/dl	Elevated, may indicate liver dysfunction or hemolysis
Alanine Aminotransferase (ALT/SGPT)	75 U/l	10 – 60 U/l	Normal ALT level
Aspartate Aminotransferase (AST/SGOT)	68 U/l	10 – 60 U/l	Normal AST level
Alkaline Phosphatase (ALP)	23 U/l	10 – 50 U/l	Normal ALP level
Gamma Glutamyl Transferase (GGT)	5 U/l	0 – 5 U/l	Normal GGT level
Creatine Kinase	130 U/l	20 – 200 U/l	Normal creatine kinase level
Cholesterol	150 mg/dl	75 – 200 mg/dl	Normal cholesterol level

Triglycerides	135 mg/dl	25 – 150 mg/dl	Normal triglyceride level
Blood Urea Nitrogen (BUN)	15 mg/dl	10 – 30 mg/dl	Normal BUN level
Serum Creatinine	1.0 mg/dl	0.5 – 1.5 mg/dl	Normal creatinine level
Urea	80 mg/dl	20 – 50 mg/dl	Normal urea level

Imaging Techniques

Ultrasound and radiography are not a specific test for FIP but can be very helpful in diagnosis as we can check the presence of fluid in the peritoneal and pleural cavity. Upon ultrasound examination, the kidney of the cat showed focally hypoechoic kidney and presence of free fluid in peritoneal and pleural cavity was noticed. Presence of fluid was also observed in the x-ray of the cat.

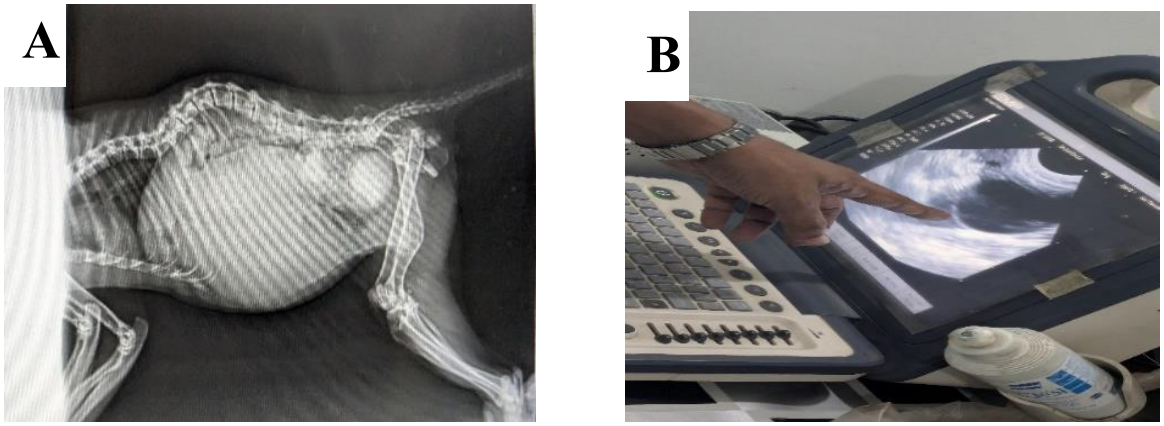

Fig: 1

A (X-ray)- Fluid accumulation in the abdominal cavity, Loss of serosal detail, Organs pushed cranially or dorsally due to the fluid volume.

B (USG)- Anechoic or hypoechoic free fluid within the abdominal cavity, Reduced clarity of organ borders due to surrounding fluid. "Floating" intestines in the effusion.

Rivalta test

For the rivalta test, peritoneal fluid of the cat was collected using a butterfly needle and a few drops of peritoneal fluid was placed in a test tube containing acetic acid. Formation of a drop like white clot or hydra like appearance was observed in the test tube which indicates a positive result.

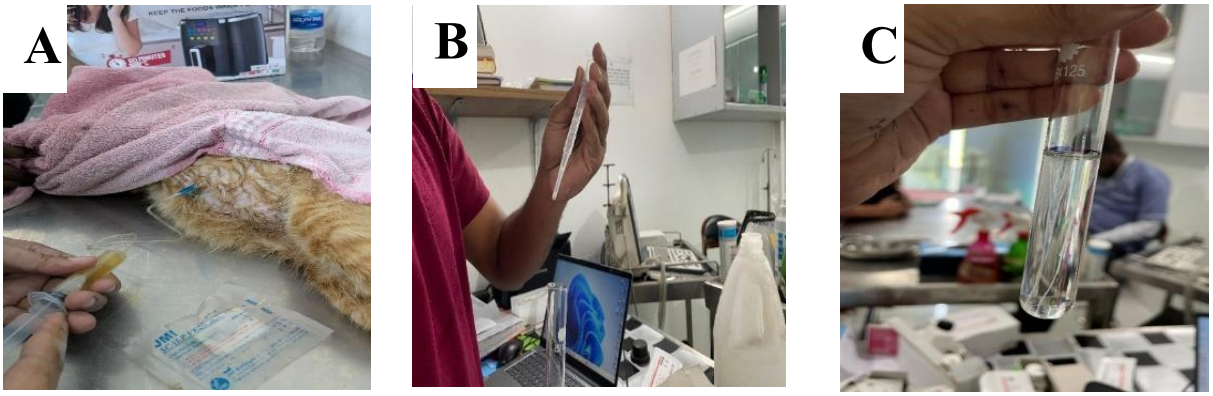

Fig: 2

A- Collection of peritoneal fluid.
B- Placing a drop of the effusion fluid (from the cat) gently into acetic acid solution.
C- The drop of effusion retains its shape, stays intact, or slowly sinks to the bottom of the tube without dispersing means positive for FIP.

Fastest FIP kit test

The positive result of the Fastest FIP Kit Test confirms the diagnosis of Feline Infectious Peritonitis (FIP) in this case. This serological test detects mutations in coronaviruses associated with FIP and strongly supports the diagnosis when combined with clinical signs and laboratory findings, such as reduced albumin-to-globulin ratio and evidence of systemic inflammation.

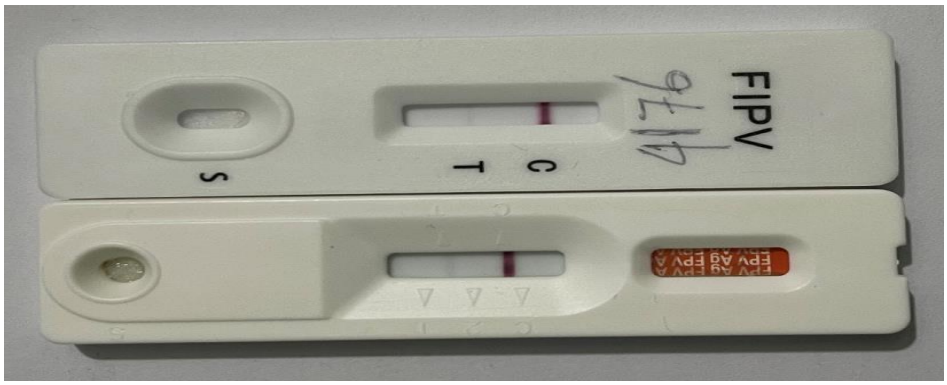

Fig: 3- A single line in the control area indicates that the test reagents are working. A line appears in the test area showing the target substance is detected, indicating a positive result.

Treatment and outcome

The cat was treated with antibiotic and antiviral drugs, along with steroidal anti-inflammatory drug and a liver tonic was also suggested. Specifically, doxycycline (Doxicap capsule) was prescribed at a dose of 10mg/kg body weight for 14 days mainly for preventing secondary bacterial infections. Injection GS-441524 was the primary antiviral therapy to directly address the underlying cause of FIP. It was prescribed at a dose of 6mg/kg body weight, subcutaneously for 84 days.GS-441524 is the active metabolite of remdesivir and it is mainly known as the gold standard treatment for FIP. It directly inhibits viral replication with proven efficacy in both wet and dry forms of FIP. The 84-day course is based on protocols that have shown a high success rate in achieving remission in FIP cases. Steroidal drug glucorticoids (Syrup. Cortisol 5mg/5ml) was used for 10days to suppress the excessive inflammatory response caused by the immune system's reaction towards the virus. A liver tonic (Syrup. Liv-52) wad used at a dose of 1ml/kg body weight twice daily for three weeks. The liver tonic was mainly used to improve hepatic function and minimize drug induced liver stress as corticosteroid and antiviral drugs can strain liver function and FIP also involves possible hepatic cells damage. Upon discharge, the cat owner was instructed to keep the cat in stress free environment and continue the prescribed treatment.

The cat was next seen 3 weeks later, at which time he appeared playful, his appetite seemed normal, less abdominal mass was noticed and his body weight was slightly increased to 4.2kg. An abdominal ultrasound showed less peritoneal fluid accumulation. The prescribed medications were continued.

Discussion

The case of an 8-month-old Persian cat diagnosed with Feline Infectious Peritonitis (FIP) highlights the severe challenges posed by this highly fatal and intricate viral disease. FIP, resulting from a mutation in feline coronavirus (FCoV), occurs in two forms: effusive (wet) and non-effusive (dry). In this instance, the cat displayed key clinical signs of the effusive form, including abdominal swelling caused by ascitic fluid, mild jaundice, and systemic inflammation. These findings align with existing literature that identifies systemic vasculitis and immune-mediated damage as the primary pathological mechanisms (Pedersen et al., 2014; Greene et al., 2024).

Clinical evaluations and diagnostic tests strongly supported the FIP diagnosis. Reduced hemoglobin levels and altered RDW-CV suggested anemia, a common consequence of systemic inflammation in FIP cases (Addie et al., 2009). A significantly low albumin-to-globulin ratio (A:G ratio of 0.49) served as a pivotal diagnostic indicator, consistent with previous studies identifying a low A:G ratio as a hallmark of FIP (Pedersen, 2009; Drechsler et al., 2011). Positive results from the Rivalta test and the FASTest FIP Kit provided additional confirmation, showcasing the multifaceted approach required for FIP diagnosis (Addie et al., 2009; Kipar & Meli, 2014).

The treatment regimen included the use of GS-441524, which has shown remarkable potential in combating FIP. This antiviral specifically targets the replication of coronaviruses linked to FIP, offering a path toward remission. In this case, the treatment led to significant improvements, such as reduced ascitic fluid, weight gain, and overall better clinical signs. These outcomes are consistent with growing evidence supporting GS-441524's effectiveness in both forms of FIP (Pedersen et al., 2014; Greene et al., 2024). Additionally, supportive therapies, including corticosteroids and liver tonics, played a crucial role in managing immune-mediated inflammation and liver strain.

This case underscores the importance of early, accurate diagnosis and the timely initiation of targeted antiviral therapies. The use of diagnostic tools like the A:G ratio, imaging studies, and confirmatory serological tests proved invaluable. Furthermore, maintaining a stress-free environment contributed to the cat's recovery from FIP (Hartmann, 2005; Felten & Hartmann, 2019).

Conclusion

This case study reaffirms FIP as a challenging, multifaceted disease with serious prognostic implications. A thorough diagnostic approach—combining clinical, biochemical, and imaging findings—was critical for accurate identification. The use of GS-441524 demonstrated its potential as a transformative treatment for FIP, establishing it as a cornerstone of modern therapeutic strategies. Supportive care addressing inflammation and liver function further facilitated the cat's recovery. This case highlights the significance of advanced veterinary care and emphasizes the ongoing need for research to enhance diagnostic and treatment options for FIP.

Limitations

This case report focuses on a single feline patient, which limits the broader applicability of its findings. Resource constraints prevented the use of advanced diagnostic methods, such as PCR for detecting viral RNA or histopathology. The short follow-up period made it difficult to evaluate long-term outcomes or the likelihood of recurrence. Key factors like stress, concurrent infections, and environmental influences were not thoroughly analyzed, potentially affecting the progression of the condition and its response to treatment. Moreover, the study relied heavily on owner-provided observations, and alternative treatment options were not available. Without genetic analysis of the virus or a comprehensive evaluation of environmental factors, deeper insights into the disease and its management were not possible.

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Biography

Mufassir Ahmad Nishan, the author of this manuscript, was born on 2nd February in the Chattogram district of Bangladesh. He is the 2nd children of Anis Ahmad and Montahi Begum. He passed Secondary School Certificate Examination (SSC) in 2016 from Chittagong Collegiate School and Higher Secondary School Certificate Examination (HSC) in 2018 from Ispahani Public School and College. Currently I am an intern veterinarian under the Faculty of Veterinary Medicine in Chattogram Veterinary and Animal Sciences University. I aspire to pursue higher education abroad, focusing on medicine, drug discovery and animal psychology.