

Presumptive feline infectious peritonitis-associated uveitis with posterior segment mass-like lesions on ultrasonography

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Abstract

5-year-old neutered male domestic shorthair cat was presented with unilateral anterior uveitis and ocular pain in the left eye without systemic signs. Ophthalmic examination revealed a superficial corneal ulcer, keratic precipitates, and aqueous flare. Ocular ultrasonography identified ciliary body thickening and a nodular mass-like lesion posterior to the ciliary body. Despite systemic corticosteroid treatment after corneal ulcer healing, no clinical improvement was observed. Computed tomography revealed contrast-enhancing thickening of the ciliary body and uveoscleral region. Enucleation and histopathology demonstrated pyogranulomatous inflammation without evidence of neoplasia or detectable infectious organisms. Immunohistochemistry for feline coronavirus antigen was not performed at that time. Therefore, idiopathic immune-mediated uveitis was initially presumed after exclusion of neoplasia and identifiable infectious agents. Three months later, similar lesions developed in the contralateral eye, accompanied by anemia and abdominal effusion, leading to a presumptive diagnosis of feline infectious peritonitis. Following treatment with FIP-specific antiviral treatment (GS-441524), the uveitis resolved. This case suggests that presumptive feline infectious peritonitis-associated pyogranulomatous inflammation posterior to the ciliary body may mimic intraocular neoplasia on ocular ultrasonography.

Keywords: cat, feline infectious peritonitis, pyogranulomatous uveitis, ultrasonography

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Introduction

Feline uveitis is a common ophthalmic disorder that may cause ocular discomfort and visual impairment (Colitz, 2005; Glaze *et al.*, 2021). Feline infectious peritonitis (FIP), caused by a mutated feline coronavirus (FCoV), is one of the recognized causes of feline uveitis (Lappin, 2000; Wegg *et al.*, 2021). Ocular manifestations of FIP include pyogranulomatous uveitis, fibrinous exudates, chorioretinitis, retinal vasculitis, and retinal detachment (Colitz, 2005). FIP most commonly occurs in young cats younger than three years of age, particularly between 4 and 16 months (Pedersen, 2014; Wegg *et al.*, 2021). However, it may also be observed in middle-aged cats up to seven years old (Pedersen, 2009; Pedersen, 2014). In such cases, where cats present outside the typical age range associated with non-effusive FIP, establishing a diagnosis may be more challenging.

This report describes a cat with presumptive FIP-associated uveitis in which the disease appeared to progress from the non-effusive form to the effusive form. Particular attention is given to the clinical, imaging, and histopathological findings, including a mass-like lesion on ultrasonography that mimicked an intraocular neoplasm.

Case Description

A 5-year-old neutered male domestic shorthair cat was presented for evaluation of discomfort in the left

eye. No systemic abnormalities were noted other than ocular discomfort. Complete ophthalmic and systemic examinations were performed. At the initial presentation, neuro-ophthalmic examinations were unremarkable except for an absent pupillary light reflex (PLR) in the left eye due to miosis. Intraocular pressures were 21 mmHg in the right eye and 25 mmHg in the left eye. Ophthalmic examination revealed a superficial corneal ulcer, iris color change, keratic precipitates, a fibrin clot, and aqueous flare (Figs. 1A and 1B). Funduscopic examination could not be performed because of miosis and ocular opacity. Blood analysis revealed a decreased albumin-to-globulin ratio of 0.5. No other remarkable abnormalities were identified on hematologic, serum biochemical, or electrolyte analyses. FIV/FelV antigen testing was negative. B-scan ultrasonography was performed after topical anesthesia using a direct corneal contact technique with a Canon Aplio i700 (Canon Medical Systems Corporation, Otawara, Tochigi, Japan) ultrasound system equipped with a linear-array transducer (i18LX5; 5–18 MHz). Images were acquired in differential harmonic imaging mode at a center frequency of 18 MHz. Sagittal and transverse views were obtained with the transducer marker oriented dorsally and temporally, respectively. Ultrasonography revealed a 7.5 x 4.5mm echogenic nodular mass with irregular margins involving the posterior ciliary body (Fig. 2A).

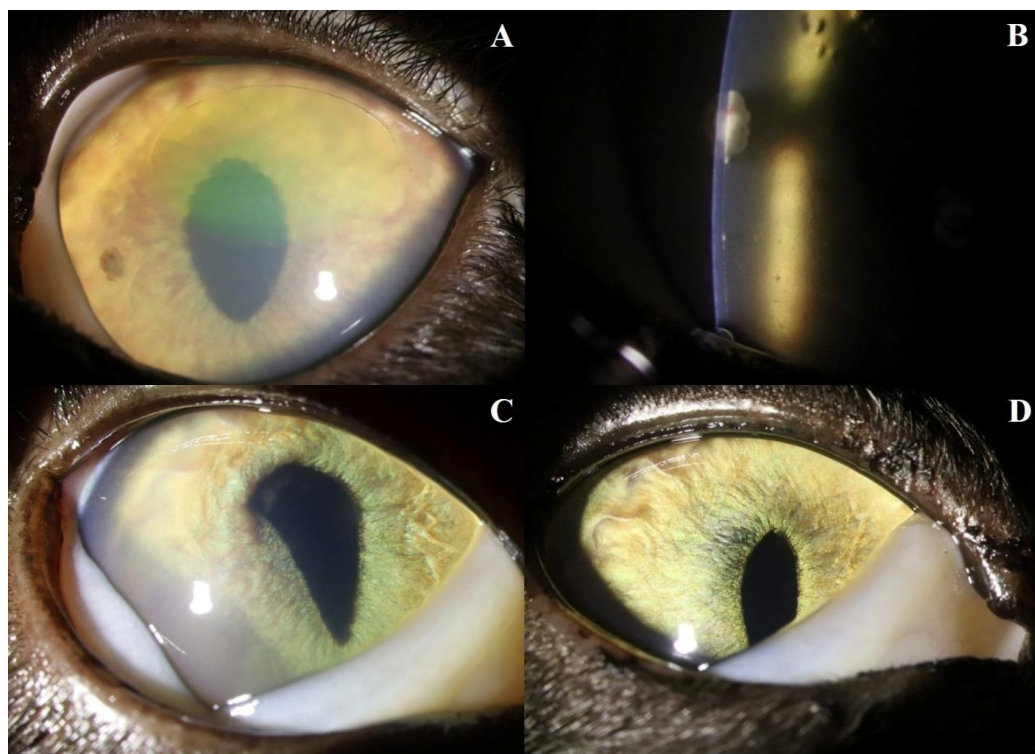


Figure 1 Slit-lamp biomicroscopic images of a cat with presumptive FIP-associated uveitis. (A) At the first visit, uveitis associated with a superficial corneal ulcer was observed in the left eye. The pupillary margin appears indistinct because of aqueous flare. (B) A slit-beam image obtained on the same day showing moderate aqueous flare and keratic precipitates in the left eye. (C) Uveitis in the right eye occurring three months after enucleation of the left eye, with mild aqueous flare and focal posterior synechiae. (D) Resolution of uveitis after 10 days of systemic treatment for FIP, together with improvement of the previously noted focal posterior synechiae in the right eye.

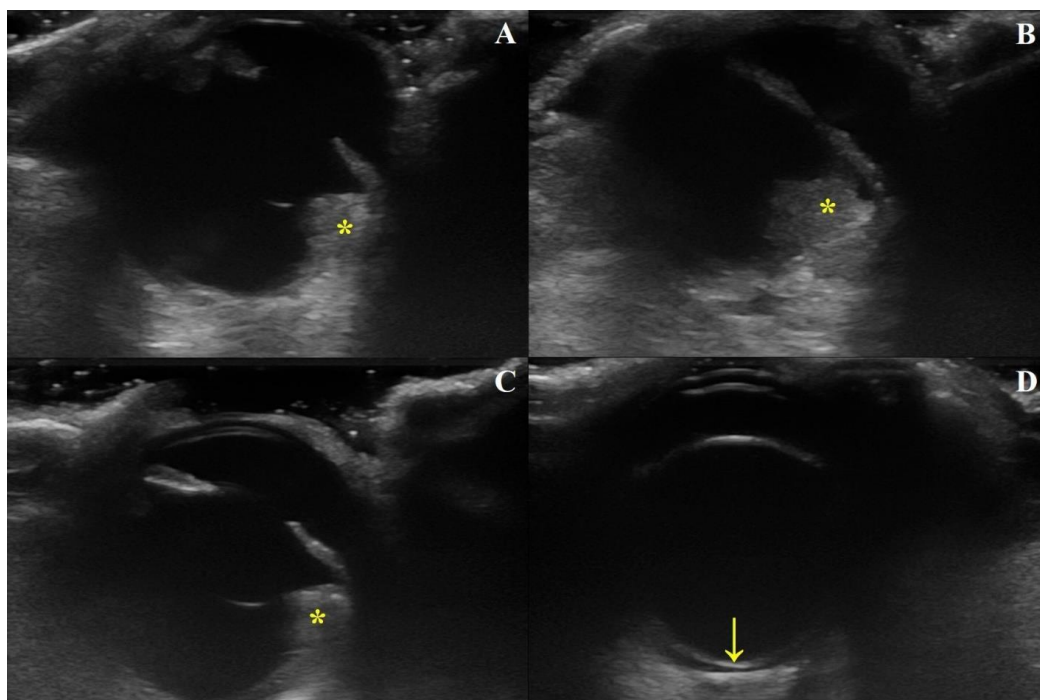


Figure 2 Ultrasonographic findings of a cat with presumptive FIP-associated uveitis. (A) At the initial visit, a hyperechoic mass-like lesion (*) is observed posterior to the ciliary body in the left eye. (B) A hyperechoic mass-like lesion (*) that remained unchanged after high-dose systemic corticosteroid treatment in the left eye. (C) A similar lesion (*) observed in the right eye three months after enucleation of the left eye. (D) Subretinal exudate (yellow arrow) observed in the same eye.

For treatment of the superficial corneal ulcer, a therapeutic contact lens and topical ofloxacin were administered. For management of uveitis, topical 1% atropine sulfate eye drops and oral corticosteroids were prescribed. After re-epithelialization of the corneal ulcer, topical 1% prednisolone acetate was added four times daily, and systemic corticosteroid therapy was increased to a high dose.

One week later, no improvement in clinical signs was observed, and the size of the mass-like lesion remained unchanged on ultrasonography (Fig. 2B). Because the uveitis had worsened, computed tomography (CT) was performed. CT was performed using an Aquilion Start CT scanner (Canon Medical Systems Corporation, Otawara, Tochigi, Japan). CT imaging revealed thickening of the ciliary body and sclera, together with a nodular lesion located posterior to the ciliary body (Fig. 3A). The uveitis was unresponsive to anti-inflammatory treatment, and the cat exhibited persistent ocular pain. Although the CT findings were considered more suggestive of inflammation, neoplasia, including lymphoma, could not be excluded. Therefore, enucleation was performed for histopathological examination. Histopathologic examination revealed a mass-like accumulation of densely aggregated inflammatory cells, including lymphocytes, plasma cells, neutrophils, and macrophages, in the ventral ciliary body and anterior choroid. This lesion corresponded closely in location to the nodular mass-like lesion identified on ultrasonography. The inflammatory infiltrates also extended throughout the iridociliary stroma and ciliary cleft, consistent with the thickening and contrast enhancement of the ciliary body and uveoscleral layer observed on CT. No evidence of neoplasia was

identified (Fig. 3B). Around the detached retina, small numbers of lymphocytes and plasma cells were observed surrounding retinal vessels. No infectious organisms were identified on special stains, including Grocott-Gomori methenamine silver, acid-fast, and Gram stains. Polymerase chain reaction testing for infectious agents and immunohistochemistry for feline coronavirus antigen were not performed at that time.

Three months after enucleation, uveitis developed in the right eye. Clinical findings were similar to those previously observed in the left eye (Fig. 1C), including a mass-like lesion posterior to the ciliary body on ultrasonography (Fig. 2C). In addition, subretinal exudate was detected as a new ultrasonographic finding (Fig. 2D). Blood analysis revealed a decreased A:G ratio of 0.35, moderate leukocytosis (WBC, $39.3 \times 10^9/L$), anemia (hematocrit, 15.2%), and moderate thrombocytopenia (platelet count, $112 \times 10^9/L$). Systemic abnormalities, including ascites, pleural effusion, and anemia, subsequently developed, raising a strong suspicion of effusive FIP. Based on the previous ocular history, progression from non-effusive to effusive FIP was suspected, and GS-441524 treatment was initiated with the owner's consent. GS-441524 was administered subcutaneously at a dose of 12 mg/kg once daily for 12 weeks. For ocular management, topical 1% prednisolone acetate and topical phenylephrine-tropicamide were administered. A reduction in intraocular inflammation was observed 3 days after initiation of treatment, and ophthalmic findings had returned to normal by day 10 (Fig. 1D). A presumptive diagnosis of FIP was made based on the progression of disease, accompanying systemic findings, and a good clinical response to GS-441524 treatment.

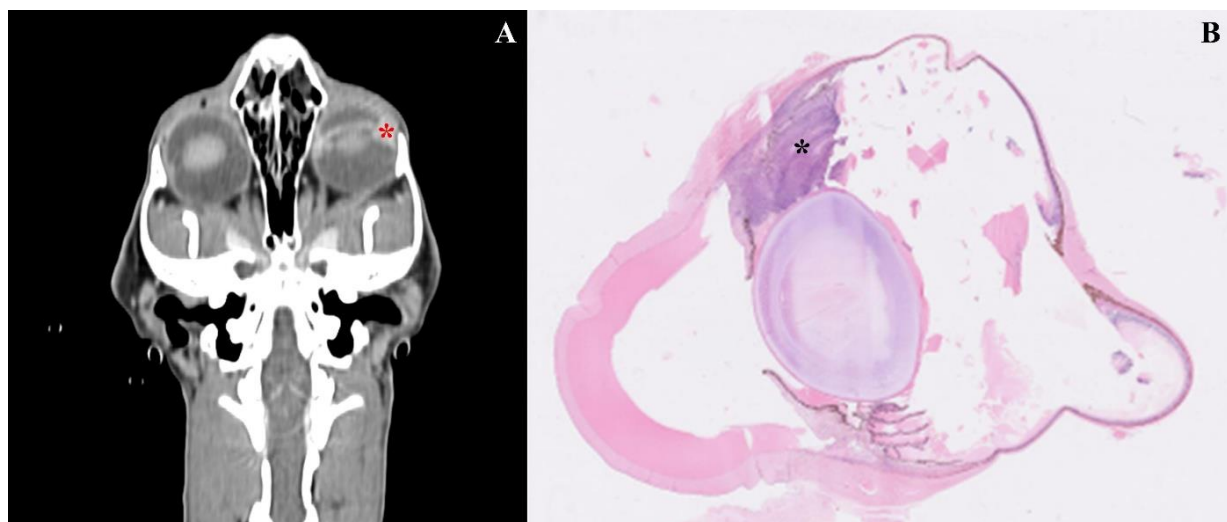


Figure 3 CT and histopathologic findings of a cat with presumptive FIP-associated uveitis. (A) The left ciliary body and anterior choroid are thickened and show marked contrast enhancement on delayed-phase imaging (*). The uveoscleral layer of the left globe is diffusely thickened compared with that of the right eye and shows stronger post-contrast enhancement. (B) Histopathology reveals a mass-like accumulation of inflammatory cells within the ciliary body and anterior choroid (*).

In summary, the cat initially presented with unilateral uveitis of the left eye without systemic signs and was treated with conventional anti-inflammatory therapy for uveitis. Because of the lack of response to treatment, CT examination was performed, followed by histopathological examination to differentiate neoplastic and infectious diseases. Histopathology revealed inflammation without identification of a specific infectious agent. The cat remained clinically well until three months later, when it presented with similar uveitis in the right eye accompanied by systemic signs strongly suggestive of FIP. Based on these findings, a presumptive diagnosis of FIP was made, and FIP-specific antiviral treatment was initiated. Ten days after initiation of antiviral treatment, the ocular signs had resolved, with concurrent improvement in systemic diseases, including anemia.

Discussion

Feline infectious peritonitis is one of the most common endogenous causes of feline uveitis (Wegg *et al.*, 2021). Ocular involvement is reported more frequently in the non-effusive form than in the effusive form. Neurologic or ocular signs have been reported in approximately 9% of cats with effusive FIP, whereas approximately 70% of cats with non-effusive FIP show neurologic or ocular manifestations, and ocular signs alone are observed in approximately 15% of cases (Pedersen, 2009; Pedersen, 2014).

After intestinal infection, FCoV may mutate into a pathogenic form capable of replicating within monocytes and macrophages and subsequently disseminating systemically, including to the uveal tract (Ziółkowska *et al.*, 2017; Ergin *et al.*, 2024). This process may result in a wide range of clinical manifestations. A recent study suggested that FCoV may initially replicate within the eye, subsequently acquire mutations, and then disseminate systemically (Martinez *et al.*, 2025). This possibility implies that ocular signs may precede systemic manifestations of FIP in some cases.

In non-effusive FIP, granulomatous or tumor-like lesions may develop in affected organs rather than fluid accumulation (Pedersen, 2009). In the present case, although anterior uveitis was the main presenting complaint, no granulomatous changes were identified in the anterior segment. However, ultrasonography revealed a mass-like lesion arising from the posterior ciliary body and choroid. Similar findings were observed in the contralateral eye at recurrence, suggesting that FIP-associated granulomatous inflammation may localize to the posterior uveal tract and appear as a mass-like lesion on ultrasonography.

CT performed before enucleation demonstrated thickening and contrast enhancement of the ciliary body and choroid. Scleral thickening was also observed, which has been reported as a relatively common finding in cats with ocular FIP lesions (Carossino *et al.*, 2022). Histopathologic examination confirmed that the mass-like lesion observed on ultrasonography represented a dense inflammatory cell infiltrate within the ciliary body and anterior choroid rather than neoplasia. These findings indicate that posterior uveal inflammation in cats with presumptive non-effusive FIP can mimic an intraocular tumor on imaging.

Several differential diagnoses should be considered when posterior segment imaging reveals a mass-like lesion. First, intraocular neoplasia should be considered. Unlike feline diffuse iris melanoma (FDIM), which is typically confined to the anterior uvea, feline atypical melanoma may arise anywhere within the uveal tract (Kayes and Blacklock, 2022). Iridociliary epithelial tumors and metastatic neoplasms, including lymphosarcoma, may also involve the posterior segment (Glaze *et al.*, 2021). Fungal infections, such as those caused by *Histoplasma capsulatum* and *Cryptococcus* spp., should also be considered as differential diagnoses, as they can cause marked granulomatous chorioretinitis (Maggs, 2009). Among protozoal infections, *Toxoplasma gondii* can cause posterior uveitis, while *Leishmania* spp., have been reported to induce granulomatous inflammation of the ciliary body in cats (Hervás, 2001). Nodular

lymphoplasmacytic inflammation has also been reported in cats with idiopathic nongranulomatous uveitis (Peiffer and Wilcock, 1991).

In this case, corticosteroids were administered before infectious causes were completely excluded because the cat lived exclusively indoors as the only cat in the household and had no known exposure to infectious sources, suggesting a relatively low risk of infection. Nevertheless, corticosteroid administration before exclusion of an infectious etiology should be approached cautiously, as its immunosuppressive effects could potentially exacerbate infectious uveitis.

The diagnosis of non-effusive FIP remains challenging (Tasker, 2018; Ergin *et al.*, 2024). Although FIP most commonly occurs in cats younger than 3 years, it may also occur in middle-aged and older cats (Pedersen, 2009; Pedersen, 2014; Černá *et al.*, 2022). In the present case, the patient was 5 years old, which is outside the typical age range and may have contributed to a lower level of suspicion for FIP during the initial diagnostic work-up. Given that a low albumin-to-globulin ratio is strongly associated with FIP, immunohistochemistry for FCoV antigen should have been considered on the enucleated globe. However, FIP was initially considered less likely because of the absence of systemic signs and the patient's atypical age.

A definitive diagnosis of FIP can be achieved by immunohistochemical detection of FCoV antigen within macrophages in affected tissues (Pedersen, 2014; Carossino *et al.*, 2022). In this case, however, the progression from non-effusive to effusive disease in the contralateral eye, together with the systemic findings and favorable response to GS-441524, supported a presumptive diagnosis of FIP (Pedersen, 2014; Andrews *et al.*, 2025).

To the authors' knowledge, although ultrasonographic findings of granulomatous lesions in other organs of cats with FIP have been described, reports focusing on ocular ultrasonographic findings are limited. This case suggests that granulomatous lesions associated with presumptive FIP uveitis may mimic intraocular tumors on imaging and should be included in the differential diagnosis of mass-like intraocular lesions in cats.

Data availability statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest: The authors have no conflict of interest to declare.

Ethical approval: Informed consent was obtained from the owner for the use of the patient's clinical information for research and publication purposes.

Statement of author contributions: **Hyun-Wook Kim:** Conceptualization, Investigation, Data curation, Visualization, Writing – original draft. **Danbee Kwon:** Investigation, Validation. **Joon-Young Kim:** Supervision, Validation, Writing – review & editing.

Declaration of artificial intelligence use: During the preparation of this work, the author(s) used ChatGPT

(OpenAI) for translation of the initial draft from Korean into English. The authors take full responsibility for the integrity, accuracy, and originality of the work.

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