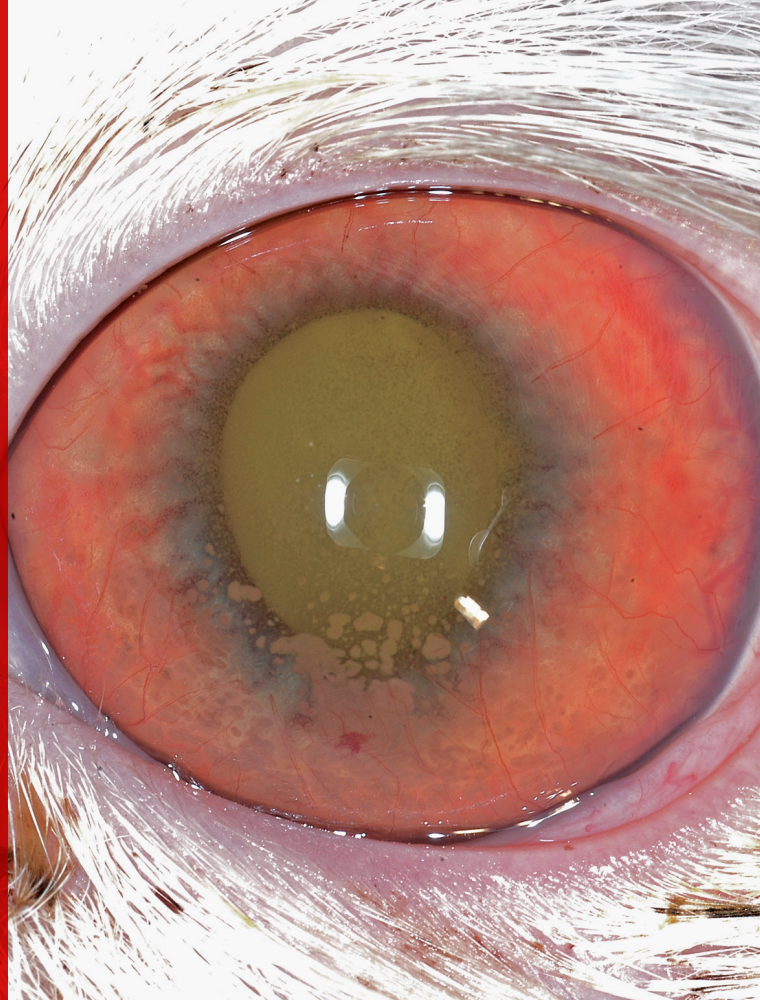


Cat with a Cloudy Eye

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▲ **FIGURE 1** Affected left eye. Mild conjunctival hyperemia is present. The cornea has 360-degree superficial neovascularization that extends to the axial cornea and is mildly edematous. Throughout the cornea are multifocal-to-coalescing white-gray opacities that are most dense ventrally, consistent with keratic precipitates. The iris appears hyperemic with abnormal vascularization (rubeosis iridis). The pupil is midrange in size, and what can be visualized of the lens appears normal.

THE CASE

Norris, a 10-year-old, neutered male domestic shorthair cat, is presented with a 3-week history of cloudiness and redness of the left eye and inappropriate urination of 2 months' duration. He is up-to-date on FVRCP, feline leukemia virus (FeLV), and rabies vaccinations and receives monthly topical heartworm, flea, hookworm, and roundworm preventive. Norris spends time both indoors and outdoors; he has no recent travel history.

On physical examination, Norris is quiet and alert and has a BCS of 3/9. Temperature, heart rate, and respiratory rate are normal. A tense abdomen prevents identification of individual organs on palpation. Seborrhea sicca and a dull hair coat are also noted. No neurologic deficits are observed.

On ophthalmic examination, the right eye appears normal with an intact menace response and intact direct pupillary light reflexes (PLR) but absent right-to-left PLR. Dazzle reflexes are intact for both eyes. The left eye has an intact menace response but an absent direct PLR and intact left-to-right PLR. There is 2+ aqueous flare, conjunctival hyperemia, and episcleral injection, as well as corneal neovascularization and keratic precipitates ventrally (**Figure 1**). The iris appears hyperemic and vascularized. The lens is only partially visible, but a tapetal reflex is noted through the pupil, and no cataract is present. The flare and corneal changes make viewing the retina difficult. Fluorescein stains of both eyes are negative, and Schirmer tear test results are normal. Tonometry measurements are 13 mm Hg and 8 mm Hg for the right

and left eye, respectively (normal, 15-25 mm Hg). No foreign body is noted behind the third eyelid of the left eye. A morphologic diagnosis of anterior uveitis in the left eye is made.

CBC, serum chemistry profile, and urinalysis, along with FeLV and feline immunodeficiency virus (FIV) testing, are recommended. Norris resists multiple attempts to obtain a urine sample, so the owners are given nonabsorbent cat litter for at-home urine collection. The FeLV/FIV SNAP (idexx.com) test is negative. Other results are shown in *Table 1*.

THE CHOICE IS YOURS ...

CASE ROUTE 1

To treat the eye with topical anti-inflammatory drugs and mydriatics, discuss chronic kidney disease with the owners, and recommend an appropriate time for recheck, see page 74.

CASE ROUTE 2

To pursue further diagnostics, see page 76.

The left eye has an intact menace response but an absent direct PLR and intact left-to-right PLR.

TABLE 1

CBC & SERUM CHEMISTRY PROFILE RESULTS

Component	Value	Reference Range
RBCs	7.22 × 10⁶/μL*	7.5-11.7
Hemoglobin	10 g/dL*	11.5-15.9
Hematocrit	29.4%*	34-48
Segmented neutrophils	3.71 × 10 ³ /μL	2.0-9.2
Bands	0 × 10 ³ /μL	0-0.3
WBCs		
Lymphocytes	2.79 × 10 ³ /μL	1.05-8
Monocytes	0.16 × 10 ³ /μL	0.08-0.32
Platelets	Clumped	169-480 × 10 ³ /μL
Blood urea nitrogen	48 mg/dL*	18-40
Creatinine	2.3 mg/dL*	0.9-2.0
Total protein	7.8 g/dL	6.6-8.4
Albumin	3.4 g/dL	3-4.3
Globulin	4.4 g/dL	2.6-4.7
Alkaline phosphatase	16 U/L	12-79
Alanine transaminase	33 U/L	29-109
Total bilirubin	0.1 mg/dL	0.1-0.7
Phosphorous	4.0 mg/dL	2.2-5.3
Glucose	180 mg/dL*	87-179
Calcium	10.3 mg/dL	9-10.8

*Value is outside the reference range.

FeLV = feline leukemia virus
 FIV = feline immunodeficiency virus
 PLR = pupillary light reflexes

CASE ROUTE 1

You elect to treat the eye with topical anti-inflammatory drugs and mydriatics, discuss chronic kidney disease with the owners, and recommend an appropriate time for recheck.

Case Progression

Norris is sent home on prednisolone acetate 1% ophthalmic suspension (1 drop in the left eye 4 times a day) and atropine ophthalmic ointment (quarter-inch strip on the left eye 2 times a day). At the 1-week recheck, Norris shows no improvement (and possible worsening) of clinical signs. Intraocular pressure (IOP) of the left eye has increased from 8 to 18 mm Hg. Additionally, the owners have noted inappetence and general lethargy. You perform a urinalysis using the urine collected at home (*Table 2*) and recommend further diagnostics; the owners consent.

Clinical Considerations

Idiopathic uveitis is a common presentation in cats, with a reported incidence of 37% to 70%.¹⁻³ Diagnosis can be made only after excluding other ocular or systemic causes; however, empirical or supportive treatment for uveitis is often instituted because of the cost or time restraints of ruling out causative disease.

The goals of treatment are to stabilize the blood-aqueous barrier, control pain, and prevent secondary complications (eg, glaucoma). Glaucoma results from accumulation of inflammatory cells, fibrin, and other debris in the iridocorneal angle; this causes decreased outflow of aqueous humor.⁴ Posterior synechiae from uveitis also can prevent outflow of aqueous humor through the pupil and cause glaucoma and iris bombé.

Mydriatics are useful in preventing synechiae and aid in pain control by reducing ciliary body spasm. Tropicamide and atropine are commonly used mydriatic agents, but tropicamide is less commonly employed for cycloplegia because most of its action is at the iris dila-

tor muscle as opposed to the ciliary body.⁵ Likewise, tropicamide's effect in pupil dilation is blunted by the presence of uveitis, wherein prostaglandins bind to receptors in the iris sphincter muscle, resulting in miosis. Atropine is a more potent cycloplegic and mydriatic with a longer duration of action; therefore, its use is preferred for uveitic eyes.^{5,6}

Care should be taken to monitor corneal health and IOP; use of parasympatholytics may cause a decrease in tear production,⁷ and use of mydriatic and cycloplegic agents has been associated with an increase in IOP.^{8,9} Immunosuppressive medications can cause recrudescence of latent feline herpesvirus 1 with subsequent corneal ulceration. Additionally, dilating agents can occasionally induce profound salivation, as the drug flows through the nasolacrimal system and is licked by the cat as it exits the nose. Use of an ointment rather than drops may ameliorate this side effect.

TABLE 2

URINALYSIS RESULTS

Component	Value	Normal
USG	1.008	1.001-1.080
pH	6.5	5.5-7.5
Protein	3+	Negative
Blood	Trace	Negative
Sediment	Lymphoid cells, 5-7/hpf; epithelial cells, 0-3/hpf	Negative

Dilating agents can occasionally induce profound salivation.

Corticosteroids (topical or oral) can be used for immunosuppression, inhibition of arachidonic acid metabolism, antifibrotic therapy, and inhibition of neovascularization. Prednisolone acetate, although less potent than dexamethasone, is formulated to have better penetration and is therefore preferred over dexamethasone. Topical treatment with steroids is ideal to limit systemic effects and has not been shown to exacerbate systemic disease.¹⁰ Contraindications include presence of a corneal ulcer or active superficial infection. Topical NSAIDs (eg, diclofenac, flurbiprofen) may be used if ulceration is present, but these alone may be insufficient in controlling active uveitis. Dosing frequency will typically correlate with uveitis severity (eg, every 6 hours for 2+ flare, every 6-8 hours for trace-1+) and can be tapered accordingly as uveitis subsides.

Setting an appropriate recheck period is an important part of managing uveitis, as it allows for assessment of patient response to treatment and of secondary complications. If uveitis improves, anti-inflammatory drugs can be continued until the eye is free of clinical signs, at which point the drugs can be slowly tapered. Mydriatics can be continued until the pupil is dilated and then tapered to the lowest dose necessary to maintain effect. The owners should be prepared for what to expect if uveitis does not improve or if systemic disease goes undiagnosed. They should also be made aware that long-term therapy may be needed.

Outcome

Despite anti-inflammatory and mydriatic therapy, secondary glaucoma is beginning to develop in Norris' eye. Although 18 mm Hg is within normal range, uveitic eyes are expected to be hypotensive¹¹; therefore, secondary glaucoma should be suspected if the IOP in a uveitic eye is in the normal or high-normal range, and pre-emptive treatment for glaucoma should be considered with regular monitoring of IOP.

If treatment for secondary glaucoma is instituted, prostaglandin analogues (eg, latanoprost) should be avoided, as they are potent miotics and may not be effective in reducing IOP in cats.¹² In the authors' experience, carbonic anhydrase inhibitors (eg, dorzolamide) or β -blockers (eg, timolol) are more effective in reducing IOP in cats.

Secondary glaucoma should be suspected if the IOP in a uveitic eye is in the normal or high-normal range.

Most importantly, the primary disease or uveitis should be adequately addressed to improve IOP.

Lack of response to reasonable anti-inflammatory treatment should increase the suspicion for more significant disease underlying the uveitis and can be the basis for recommending further diagnostics. If the owners decline further diagnostic investigation, options typically include increasing the frequency of topical medications or treating with systemic anti-inflammatory drugs, with the caveat that systemic disease could be made worse by oral steroids or NSAIDs.

Your Choice's Implications

Therapeutic treatment for uveitis is appropriate, as therapy for the eye is important for quality of life. However, further testing should also be recommended in case systemic disease is present. If the owners decline further diagnostic testing, they should be informed of the risk for missing potentially significant or treatable disease that could affect the patient's long-term prognosis. Basic bloodwork and urinalysis, along with testing for common infectious diseases, are a good starting point.

IOP = intraocular pressure

CASE ROUTE 2

You elect to pursue further diagnostics.

Case Progression

Because of Norris' age, you recommend medical imaging bloodwork to rule out additional disease.

Thoracic radiography is within normal limits, but abdominal radiography shows marked renomegaly of both kidneys, with noted irregular borders and shape of the kidneys (**Figure 2**). Abdominal ultrasonography shows a hyperechoic, irregular kidneys (**Figure 3**). You perform ultrasound-guided fine-needle aspiration of the left kidney, which contains lymphoid and lymphoblast cells (**Figure 4**).

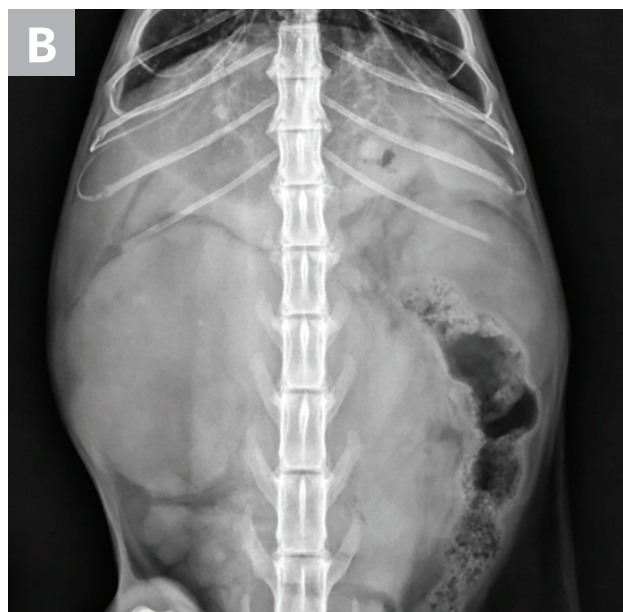
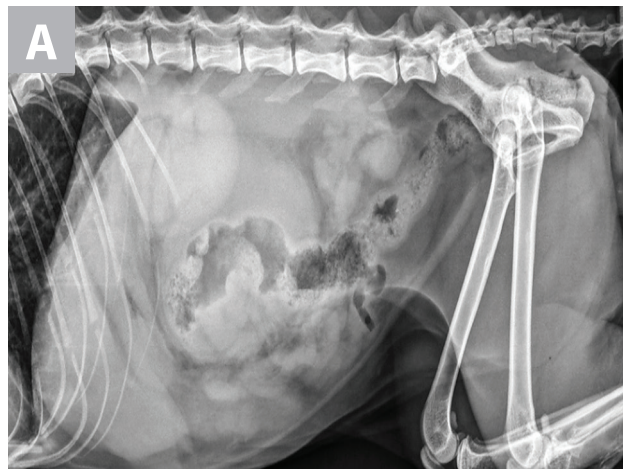
Norris is diagnosed with primary renal lymphoma and secondary uveitis. The owners elect to pursue chemotherapy.

Clinical Considerations

Although idiopathic uveitis is common, uveitis may be secondary to systemic disease. With anterior uveitis, time and financial costs often complicate diagnosis of idiopathic or immune-mediated (ie, lymphoplasma-cytic) disease. Concurrent posterior segment disease (eg, chorioretinitis) should increase suspicion for underlying systemic disease but may be difficult to appreciate. Extensive testing and imaging may be required to diagnose idiopathic disease.

Infectious causes of anterior uveitis can include FeLV, feline infectious peritonitis, FIV, *Toxoplasma* spp, *Cytospora* spp infestation, fungal infection (eg, *Histoplasma* spp, *Cryptococcus* spp, *Coccidioides* spp), and *Bartonella* spp. Clinical intuition, geography, and presentation can guide prioritization of infectious disease testing; results should be interpreted according to estimated positive or negative predictive value.¹³

Trauma can be a direct cause of uveitis in cats and is usually witnessed or inferred by patient history.



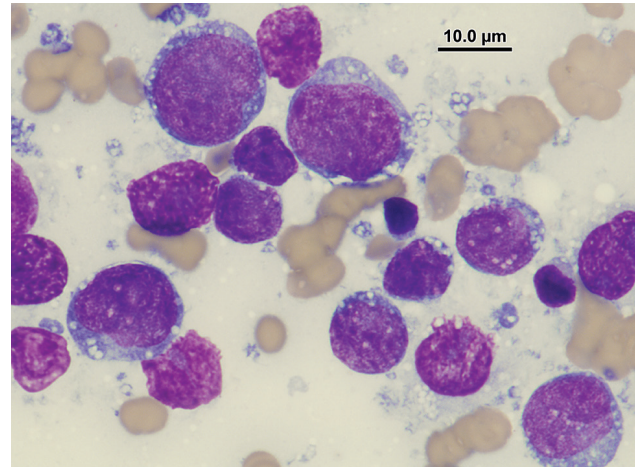
▲ **FIGURE 2** (A) Abdominal right lateral and (B) ventrodorsal radiographs. The liver is mildly enlarged with rounded margins. The head of the spleen appears mildly enlarged, with the remainder of the organ not conclusively visualized. The stomach contains a small volume of gas. The small intestine and large intestine are displaced ventrally. The kidneys are bilaterally severely enlarged, with the right kidney more severely affected. There are lobulated soft-tissue masses within the caudodorsal abdomen dorsal to the urinary bladder and colon, and there is nominal mottling of peritoneal fat. Circular opacities can be observed within the plane of the lung, liver, and stomach. Images courtesy of Silke Hecht, Dr.med.vet., DACVR, DECVDI, University of Tennessee

FeLV = feline leukemia virus

FIV = feline immunodeficiency virus



▲ **FIGURE 3** Abdominal ultrasound of left kidney. The kidney is enlarged and hyperechoic. There are multiple linear hyperechoic striations that radiate from the medulla into the cortex, as well as an ill-defined hypoechoic subcapsular rim surrounding a portion of the kidney. *Image courtesy of Silke Hecht, Dr.med.vet., DACVR, DECVDI, University of Tennessee*



▲ **FIGURE 4** Cytology of kidney aspirate. Neoplastic cells (ie, large round cells with large nuclei, stippled chromatin, and a small amount of basophilic cytoplasm that contains clear, punctate vacuoles) can be seen. Also present are 2 small lymphocytes with highly condensed chromatin, as well as erythrocytes, free nuclei from lysed cells, and cytoplasmic fragments (ie, lymphoglandular bodies). *Wright's stain. Image courtesy of Michael M. Fry, DVM, MS, DACVP, University of Tennessee*

Systemic treatment with anti-inflammatory drugs (eg, systemic prednisolone, NSAIDs) can usually be safely instituted in these cases. Patients with penetrating trauma should receive concurrent antibiotic therapy with a recommendation for surgical repair, if indicated. For cats that lose vision, enucleation is recommended (even if the eye is comfortable) because of the risk for posttraumatic ocular sarcoma.¹⁴ These sarcomas are generally aggressive and invasive and may break out of the eye into the orbit or travel up the optic nerve into the brain. Development can occur months to years after the initial injury.¹⁴

Neoplasia can affect the eye as a primary or metastatic condition. The most common primary neoplasia of the eye in cats is iridal melanoma; lymphoma is the most common metastatic tumor of the eye.^{15,16} One study reported ocular involvement in 48% of cats with systemic lymphoma.¹⁷ Other ocular metastatic neoplasias include fibrosarcoma, squamous cell carcinoma, mammary adenocarcinoma, uterine adenocarcinoma, and other adenocarcinomas of unknown origin.¹⁵

Norris' prognosis is poor. Treatment options and expected outcomes should be communicated with the

clients. Lymphoma is a systemic disease, so chemotherapy is the treatment of choice; a multimodal approach shows the greatest opportunity for success.¹⁸

Outcome

Supportive therapy for uveitis with topical anti-inflammatory drugs and mydriatics (as detailed in Case Route 1, page 74) should be started concurrently with chemotherapy. Treating the underlying lymphoma will typically result in improvement of secondary uveitis, unless there are secondary complications (eg, glaucoma) or chronic changes to the uveitic eye (eg, synechiae) that may persist.

Your Choice's Implications

Pursuing diagnostics at a more accelerated pace allows for earlier identification of underlying disease. This may allow for better treatment and prognosis. However, because of the prevalence of idiopathic disease, the owners should be informed of the possibility of negative tests. If idiopathic uveitis is confirmed, systemic treatment with anti-inflammatory drugs (eg, oral prednisolone) can be more safely instituted if the eye does not respond to topical medications alone. ■

See page 108 for references.

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