OPHTHALMOLOGY

Feline Corneal Ulcers: Diagnosis and Management

***Louise O'Leary**, MVB, DACVO*
***Inês Mesquita**, DVM*
University College Dublin School of Veterinary Medicine, Dublin, Ireland

GET CONTINUING EDUCATION CREDIT

Scan the QR code after reading this article to take the quiz at vetfolio.com and earn free CE.

Abstract

Corneal ulcers are among the most common ophthalmic diseases diagnosed in feline practice. Their treatment approach differs from that of corneal ulcers in dogs due to differences in etiology, management options, complications, and prognosis. Many corneal ulcers in cats, including both acute and chronic nonhealing superficial corneal ulcers, are directly or indirectly secondary to feline herpesvirus 1; identifying the specific etiology is essential for guiding appropriate treatment. This article focuses on the diagnosis of feline corneal ulcers based on eye examination findings and adjunctive testing, as well as the medical and surgical management of specific types of corneal ulcers.

Parilov/shutterstock

Take-Home Points

- Feline herpesvirus 1 (FHV-1) is a common corneal ulcer etiology in cats and can be presumed unless another cause is identified.
- There is no reliable diagnostic test for FHV-1. Herpesvirus is often diagnosed based on clinical signs and response to therapy rather than laboratory testing.
- Superficial nonhealing corneal ulcers with loose epithelium can be secondary to FHV-1 in cats, requiring mechanical interventions (e.g., cotton-tipped applicator debridement, diamond burr debridement, superficial keratectomy) in conjunction with antiviral therapy to heal.
- Corneal sequestrum is a common complication in cats with nonhealing ulcers that confounds treatment. Prompt identification and treatment of ulcers are important to avoid this complication.

The cornea is an avascular, transparent structure. In dogs and cats, it is roughly 0.6 mm thick, consisting of 90% stromal collagen covered by a 6- to 10-layer epithelium anteriorly and the endothelium–Descemet's membrane complex posteriorly.[1,2] Despite similar anatomy in the 2 species, the most common corneal diseases differ between dogs and cats, particularly in etiology and treatment of corneal ulceration (**TABLE 1**).

Etiologies

Epithelium is normally anchored to its basement membrane and anterior stroma and undergoes continuous renewal, with complete turnover estimated every 1 to 2 weeks. Corneal ulcers result from epithelial loss, exposing the underlying stroma. Etiologies of corneal ulcers can be divided into 3 categories:

- **Mechanical epithelial removal:** These cases include entropion, trichiasis, distichia, ectopic cilia, foreign bodies, and trauma. While common in dogs, these are rare in cats, except entropion, which is common in both species.[3]
- **Increased epithelial vulnerability:** These patients have epithelial loss due to impaired corneal health (e.g., dry eye, brachycephalic ocular syndrome, facial nerve paralysis, buphthalmos, corneal edema). Brachycephalic ocular syndrome is common in both dogs and cats; otherwise, these causes are less common in cats.[3]
- **Spontaneous epithelial loss:** Epitheliotropic feline herpesvirus 1 (FHV-1) is the most common cause of corneal ulcers in cats. Spontaneous chronic corneal epithelial defects (SCCEDs), or indolent ulcers, are common in dogs but have not yet been definitively demonstrated to occur from the same pathophysiology in cats.

Secondary Infection

Epithelial loss compromises corneal defenses, which can allow opportunistic pathogens to invade and colonize the stroma at any time. The most common pathogens in cats are *Staphylococcus* species, followed by *Streptococcus*, *Pseudomonas*, *Bacillus*, or *Pasteurella* species.[3-6] Proteolytic enzymes from bacteria and inflammatory cells cause stromal digestion, ulcer deepening, and widening. Descemetoceles occur when stromal loss exposes the Descemet's membrane. Keratomalacia (melting ulcer) occurs when proteolytic enzymes induce rapid stromal liquefaction. Corneal perforation is a possibility once an ulcer is deep enough to compromise mechanical integrity, anecdotally considered a concern once the stromal loss begins to exceed 50% depth. Severe reflex uveitis (e.g., hypopyon, hyphema) can accompany infected ulcers.

Diagnosis

Ulcer diagnosis requires fluorescein staining to confirm

TABLE 1 Comparison of Common Causes of Corneal Ulcers in Dogs and Cats

CAUSE	CATS	DOGS
Herpesvirus	Most common (feline herpesvirus 1)	Rare (canine herpesvirus 1)
Distichia	Rare	Common
Ectopic cilia	Rare	Common
Trichiasis	Rare; may be from eyelid agenesis	Common, usually from nasal hair trichiasis if present; eyelid agenesis rare
Brachycephalic ocular syndrome	Common	Very common
Entropion	Common	Common
Aqueous tear film deficiency (i.e., keratoconjunctivitis sicca)	Less common than in dogs	Very common
Qualitative tear film deficiency (i.e., mucin and/or lipid deficiency)	Less common than in dogs	Very common
Spontaneous chronic corneal epithelial defect	Definitive identification via histopathology of this type of ulcer has not yet occurred in cats; assume herpetic if ulcer of this clinical appearance	Very common
Corneal edema	▪ Feline acute corneal hydrops is uncommon ▪ Endothelial dystrophy and degeneration are rare ▪ May also occur secondary to uveitis, glaucoma, and anterior lens luxation	▪ Common; typically secondary to corneal endothelial dystrophy or degeneration ▪ Corneal hydrops is rare ▪ May also occur secondary to uveitis, glaucoma, and anterior lens luxation
Calcific corneal degeneration	Rare	Common
Trauma/foreign bodies	More common in outdoor cats but less common than in dogs	More common than in cats

epithelial loss, as well as identification of the underlying etiology and any secondary infection through a thorough ocular examination.

History and Signalment

Brachycephalic cats are at increased risk of ulcers.[7] Maine coons, males, young adults, and middle-aged to older cats are predisposed to entropion.[8] A history of stress, immunosuppression, corticosteroid use, concurrent systemic disease, prior ulcers, conjunctivitis, or upper respiratory signs supports FHV-1 involvement. A history of corticosteroid or cyclosporine therapy may be noted with feline acute corneal hydrops (also known as acute feline bullous keratopathy).[9,10]

Ocular Examination

A complete ocular examination includes neuro-ophthalmic examination, conformation assessment (e.g., evaluating lower eyelid position to rule out entropion [**FIGURE 1**] and the severity of brachycephalic ocular features), and assessment of ocular structures (e.g., eyelids, cornea, intraocular structures) using magnification and a light source. Screen for the following:

- **Stromal loss** (i.e., corneal flattening or depression [**FIGURES 2–4**]), **yellow-white infiltrates** (**FIGURES 2, 4, AND 5**), **keratomalacia** (i.e., soft, sagging, gelatinous cornea [**FIGURE 4**]), or **uveitis** (e.g., flare, hypopyon, hyphema, iritis). Assume secondary infection if any of these changes are noted.
- **A focal, raised area**, made up of coagulated fibrin or iris, indicating a corneal perforation (**FIGURE 6**).
- **Loose epithelium**, analogous to a wrinkled bedsheet or the peeling outer layer of onion skin, consistent with a nonhealing indolent ulcer (**FIGURES 7 AND 8**).
- **Corneal neovascularization**, which indicates chronicity, as it typically takes a few days to form, starting at the limbus and progressing further into the cornea with time.[11] Dense, nonbranching,

paintbrush-like vessels indicate deep disease (e.g., deep corneal ulcer, deep corneal infection [**FIGURES 2, 4, AND 5**]) and thin, branching vessels indicate superficial disease (e.g., superficial ulcer [**FIGURES 7–9**]).

- **Corneal sequestrum formation** (i.e., a tea-stained or dark brown to black discoloration of the cornea [**FIGURES 3, 10, AND 11**]).
- **White-to-pink plaques,** which are suggestive of eosinophilic keratitis.
- **Blue-to-white cobblestoning,** which indicates corneal edema. This finding can be seen in chronic superficial ulcers, where epithelial loss and neovascularization allow stromal hydration (**FIGURE 8**) and deep or infected ulcers. It is suspicious for feline acute corneal hydrops if accompanied by gross corneal swelling and forward corneal bulging.

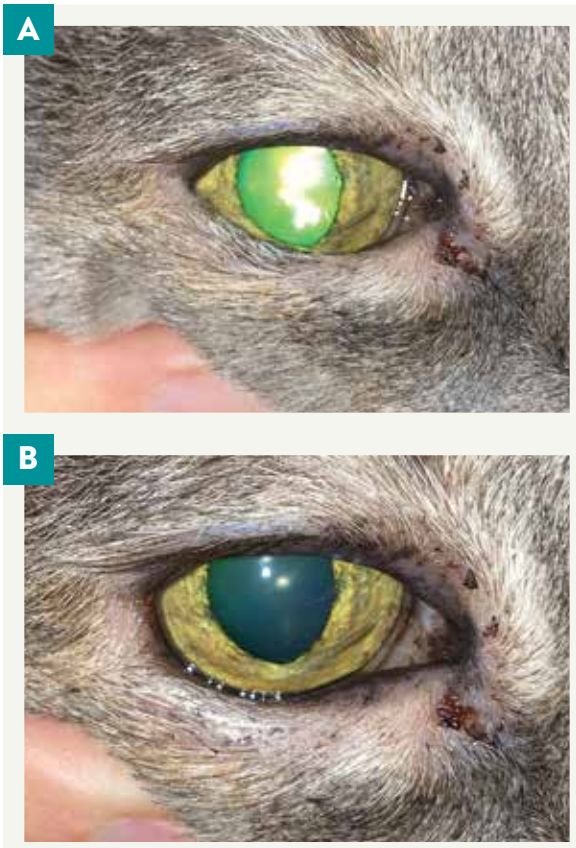

FIGURE 1. (A) Lower lid entropion in a geriatric cat. Note that the hairless lower eyelid margin cannot be visualized. **(B)** The lower eyelid has been rolled out to reveal the hairless eyelid margin (which is often pigmented), confirming the presence of entropion.

Adjunctive Tests

Schirmer Tear Test

The Schirmer tear test (STT) measures aqueous tear production and is indicated for patients with chronic/recurrent ulcers or corneal neovascularization/opacification. Perform this test before applying any topical agents (e.g., fluorescein). Diagnosis of feline tear deficiency requires an STT < 9 mm/min on 2 separate occasions with clinical signs (**FIGURE 12**).[12,13]

Fluorescein Staining

Fluorescein binds to exposed corneal stroma. Evaluate the cornea before fluorescein staining to avoid masking

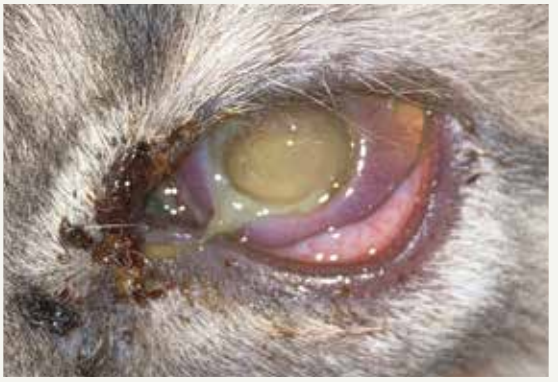

FIGURE 2. Large, deep, stromal, infected central corneal ulcer. Note the clear cornea depression and cream infiltrates and soft appearance of the ulcer bed. Deep corneal neovascularization is present, extending toward the ulcer site.

FIGURE 3. Deep, infected corneal ulcer. Note the moat-like area of stromal loss **(dotted outline)** surrounding a black corneal sequestrum. Corneal neovascularization is growing toward the ulcer site. The sequestrum is full thickness and would result in globe rupture after sloughing, if medically managed.

subtle infiltrates. Apply fluorescein stain to any eye with signs of ocular pain (e.g., blepharospasm, epiphora), redness, or opacity, then rinse excess and examine under cobalt blue light. Staining characteristics can suggest underlying etiologies, including:

- **Mechanical epithelial removal.** Stain location can be a key indicator to cause; axial staining is associated with brachycephalic ocular syndrome, ventrolateral with entropion, and ventromedial with third-eyelid foreign bodies.[7]
- **Herpetic ulcers.** Typically geographic; dendritic patterns are rare but pathognomonic. Superficial ulcers with hazy, indistinct borders from stain migration underneath loose epithelium indicate FHV-1.
- **Descemetoceles.** No uptake at the center (exposed Descemet's membrane); uptake occurs only in the surrounding stromal ring.
- **Eosinophilic keratitis.** Uptake on pink-to-white plaques does not indicate a true ulcer; uptake elsewhere indicates concurrent true ulceration, which is common with this disease.
- **Feline acute corneal hydrops.** Massive edema with a protruding cornea due to a spontaneously ruptured Descemet's membrane that allows rapid and

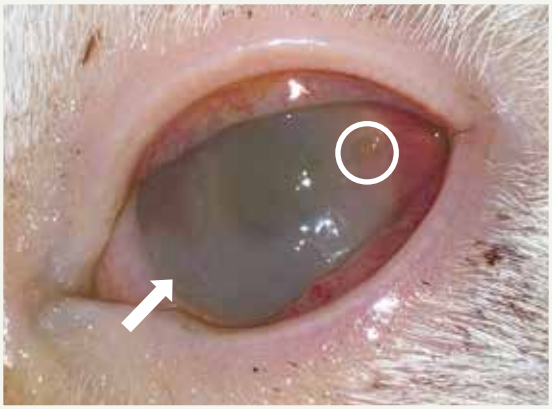

FIGURE 4. Heavily infected corneal ulcer. Note the diffuse yellow-cream corneal infiltrates **(arrow)**; soft, malacic corneal appearance; and focal area of stromal loss **(circle)**, all consistent with infection. Deep corneal neovascularization is growing toward the foci of infection. This case responded well to targeted, intensive topical antibiotic therapy.

FIGURE 5. Infected corneal ulcer. There is no stromal loss, but multifocal areas of yellow-cream infiltrates are present in the cornea **(arrow)**. Deep corneal neovascularization is growing toward the foci of infection.

FIGURE 6. Corneal perforation. Note the irregular, protruding corneal surface with dyscoria from anterior iris prolapse, attempting to plug the defect.

FIGURE 7. Chronic, superficial herpetic ulcer. Note the branching superficial neovascularization, indicative of superficial disease and chronicity, and ring of loose epithelium in the center of neovascularization.

dramatic corneal hydration, which may be accompanied by corneal ulceration.[10,14] Distinguish from melting ulcers, as treatment differs.

Seidel Test

The Seidel test is used to identify a leaking corneal perforation. Wet a fluorescein strip with a drop of sterile saline, then gently "paint" the suspicious area with the strip. This applies concentrated fluorescein stain. Do not rinse. Examine the area under cobalt blue light and magnification using a direct ophthalmoscope. Leaking aqueous humor creates a "waterfall" effect by diluting the stain.

Qualitative Tear Film Assessments

These tests identify lipid and/or mucin deficiencies, usually linked to FHV-1.[15] Rose bengal (or lissamine green) stain identifies devitalized, mucin-deficient epithelium and early herpetic lesions in which some epithelial cell death is present, but the stroma is not exposed. The tear film break-up time test measures tear

FIGURE 8. Chronic, superficial herpetic ulcer. Note the branching superficial neovascularization, indicative of superficial disease and chronicity, and peeling epithelium. The cat also has significant conjunctivitis and blepharitis, with depigmentation of the eyelid margins secondary to a topical cidofovir hypersensitivity. Corneal edema is present with blue-white cobblestoning of the cornea overlying the pupil.

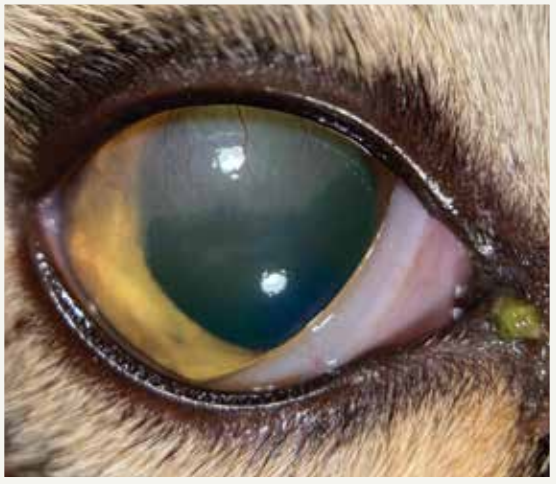

FIGURE 9. Chronic, superficial, herpetic ulcer with corneal opacification and branching superficial neovascularization. The corneal opacity and irregularity are secondary to loose epithelium.

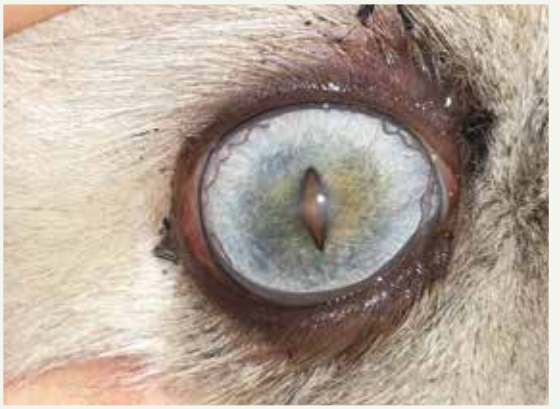

FIGURE 10. Axial corneal brunescence consistent with sequestrum formation in a Persian cat. The cat had a history of an axial corneal ulcer prior to sequestrum development.

FIGURE 11. Black corneal sequestrum formation in a cat with a chronic herpetic ulcer. Note neovascularization indicative of chronicity. This sequestrum was 80% of the corneal depth and risked ocular perforation after sloughing had it been managed medically alone. This eye was surgically treated with keratectomy to excise the sequestrum and corneoconjunctival transposition to address the residual deep defect.

film stability, with values <10 seconds indicating deficiency.[12] Cochet–Bonnet esthesiometry can detect reduced corneal sensitivity, usually a metaherpetic change, and, while rarely performed, conjunctival biopsies can confirm mucin loss through reduced goblet cell density.[15]

Targeted Pathogen Identification

Paired corneal cytology and bacterial culture are indicated for potentially infected ulcers to identify bacteria and guide antibiotic therapy. If antibiotic susceptibility testing results are provided, interpret them cautiously; they are based on systemic concentrations and may not reflect in vivo efficacy of topical therapy, which can achieve ocular surface concentrations dramatically higher than serum levels.[16,17] However, these high concentrations are rapidly diluted and washed away by the tear film, requiring repeated applications to maintain.

Herpesvirus Testing

Laboratory testing (e.g., serology, PCR) for FHV-1 is controversial and imprecise due to a variety of factors.[18-20] For one, no diagnostic test can differentiate between wild-type and vaccine virus. In addition, false positives are possible because normal cats can shed the virus, and false negatives are also possible because diseased cats can shed the virus intermittently. Due to the challenges of test results, FHV-1 is typically diagnosed based on history, clinical signs, and response to therapy rather than laboratory testing.

FIGURE 12. Aqueous tear deficiency. This patient had recurrent corneal ulcers, superficial neovascularization (thin, branching), and a lackluster tear film (note irregular flash artifact). Schirmer tear test results were < 9 mm/min on 2 separate occasions, confirming the diagnosis.

Principles of Corneal Ulcer Treatment

Regardless of ulcer type, the fundamental management principles are consistent:

1. Address the underlying cause.
2. Provide appropriate topical antimicrobial therapy (prophylactic if infection is not present or intensive and targeted for an active infection).
3. Control pain.
4. Support healing.

Specific treatments vary with the ulcer's etiology, depth, and chronicity and presence of infection.

Address the Underlying Cause

FHV-1 Ulcers

Any feline ulcer, including acute and chronic, superficial, nonhealing ulcers, can be presumed herpetic unless another cause is identified.

Prompt antiviral therapy speeds up healing and reduces complications (**TABLE 2**). Antivirals are virostatic, reducing viral load to allow the immune system to return the virus to dormancy. Continue antivirals 1 to 2 weeks beyond disease resolution. Lower dosing frequencies and the route (topical versus oral) best tolerated by the individual cat are preferred to minimize stress. Despite widespread use, lysine should not be relied upon as an effective antiviral to treat active herpetic disease, as evidence supporting its efficacy against FHV-1 is at best mixed.[31-34]

FIGURE 13. Same eye as **FIGURE 9**. After cotton-tipped applicator debridement, the true extent of the nonhealing ulcer is revealed.

After topical anesthetic application, cotton-tipped applicator (CTA) debridement of any loose, virus-laden epithelium may promote healing of nonhealing superficial ulcers. It can also unmask ulcers when fluorescein staining appears negative (**FIGURES 9 AND 13**) but epithelial irregularity and blepharospasm suggest an ulcer concealed by loose epithelium.

Superficial, Nonhealing Ulcers With Loose Epithelium

Clinically, these resemble SCCEDs, also called indolent ulcers, seen in dogs; however, in cats, they are frequently, but not always, herpetic in origin.[35-38] Despite the potential difference in pathogenesis between superficial, nonhealing ulcers with loose epithelium in dogs and cats, both are managed with interventions to stimulate healing:

- **CTA debridement:** A first-line intervention to remove loose epithelium that can be repeated every 2 to 3 weeks.[36,38]
- **Diamond burr debridement:** Noninvasive; indicated if CTA debridement fails (>80% success rate at healing in 2 to 6 weeks).[36,38]
- **Superficial keratectomy:** Indicated for persistent cases or if there is concurrent sequestrum; requires referral (approximately 85% success rate at healing in 4 weeks).[36,37]
- **Bandage contact lenses:** Can be applied postprocedure and may help improve comfort and promote epithelialization.[39,40]

Due to the concern for these ulcers being caused by herpesvirus in cats and the difficulties in reliable diagnosis of herpesvirus via laboratory testing, concurrent antiviral therapy can be beneficial, but it may not be necessary for every cat.[35-38]

Importantly, these interventions are not appropriate in an infected ulcer, particularly if stromal loss is present. Additionally, unlike in dogs, where it is used to treat SCCEDs, grid keratotomy is contraindicated in cats due to the risk of corneal sequestrum formation.[35]

Entropion-Related Ulcers

Entropion is classified as primary/anatomic or secondary/spastic. With spastic entropion, the eyelid only rolls in when corneal pain is present. These are differentiated using topical anesthesia, which temporarily resolves spastic entropion. Unlike dogs, in which anatomic entropion is typically seen in juveniles, in cats, primary entropion occurs in both young adults and geriatric patients, often due to senile orbital fat loss and enophthalmos.

TABLE 2 Antiviral Therapy Options for Feline Corneal Ulcers

DRUG*	ROUTE OF ADMINISTRATION	DOSE	NOTES
Famciclovir[21]	Oral	90 mg/kg q12h	▪ Lower doses are not advised because, while they are potentially effective, treatment response is slower.
Ganciclovir 0.15%[22,23]	Topical	q8h	▪ Well tolerated
Cidofovir 0.5%[24,25]	Topical	q12h	▪ May cause blepharitis with prolonged use (**FIGURE 8**)
Penciclovir 1% lip cream[26,27]	Topical	q12h	▪ Appears well tolerated
Idoxuridine 0.5%[28]	Topical	5× daily	▪ Can cause irritation
Trifluridine[28]	Topical	4–6× daily	▪ Can cause irritation
Dilute povidone-iodine (0.5%–1%)[29,30]	Topical	4-6× daily	▪ Budget-friendly ▪ Broad-spectrum antiseptic option with proven in vitro activity against feline herpesvirus 1 and common opportunistic bacteria ▪ Clinical efficacy is supported only by ex vivo studies and anecdotal reports of use in clinical patients[30]

**Antiviral drugs are generally used off-label for veterinary patients in the United States.*

Surgical correction via the Hotz-Celsus procedure is recommended for anatomic entropion. In cats, concurrent lateral canthal closure can improve outcomes. In this procedure, a 2- to 3-mm long and 1- to 2-mm wide strip of both the upper and lower eyelids is resected at the lateral canthus, and the resected lid margins are sutured together in a single layer.[41] This can help stabilize the eyelids to reduce the risk of entropion recurrence.[41]

Temporary entropion correction options include temporary tacking sutures for spastic cases and subdermal hyaluronic acid fillers as a nonsurgical alternative, performed under local anesthesia for mild to moderate senile entropion. Repeated injections of subdermal hyaluronic acid filler may be required as the product breaks down.[42]

Lubrication-Responsive Diseases

Topical lubrication with a sodium hyaluronate–containing gel (3× to 4× daily) is essential for cats with dry eye (aqueous, mucin, or lipid deficiencies) or brachycephalic ocular syndrome. In cats, FHV-1 is the primary cause of tear film deficiencies.[13,15] Unlike dogs, cats respond poorly to lacrimostimulants and typically require tear replacement therapy alone.[13] For brachycephalic cats, lubrication mitigates exposure-related irritation and inflammation. Medial canthoplasty to surgically reduce eyelid opening width and reduce corneal exposure is also useful.

In cats, avoid ointments and, ideally, preservative-containing products for long-term use (>2 to 3 weeks) due to frequent hypersensitivity to lanolin, petrolatum, and preservatives.[43] Cross-linked hyaluronic acid (i.e., sodium hyaluronate) gels are preferred for their superior ocular surface retention times (e.g., Ocunovis, Sentrx).[44]

Feline Acute Corneal Hydrops/Feline Acute Bullous Keratopathy

This condition is typically treated with a third eyelid flap to tamponade the cornea, which is left in place for 21 days. This procedure has an 85% success rate.[10]

Provide Antimicrobial Therapy

Antimicrobial therapy for corneal ulcers is either prophylactic for noninfected ulcers of any etiology or targeted and intensive if secondary infection is present.

Noninfected Ulcers

Prophylactic topical antibiotics with a spectrum that covers the most common secondary invading pathogens (e.g., tobramycin, chloramphenicol, erythromycin, chlortetracycline) are used 2 to 4 times daily. Fluoroquinolones and polymyxin-containing products should be avoided in noninfected ulcers to preserve antibiotic stewardship.[45,46] Avoid using ointments for more than 2 to 3 weeks in cats.[43]

Although prophylactic antibiotic therapy is considered poor antibiotic stewardship, an exception is made in situations where the risk of infection is high and infection consequences would be catastrophic.[47] Prophylactic therapy of corneal ulcers is considered to meet these criteria, and the current standard of care is to include topical antimicrobials in the treatment of noninfected ulcers. However, efforts can still be made to reduce antibiotic usage, such as considering antibiotic alternatives for prophylaxis of noninfected ulcers. This involves using products that have antibacterial activity against the most common pathogens that infect corneal ulcers but do not have the same risk of inducing antibiotic resistance.[29,48] Such products can be applied 3 to 4 times daily and include the following:

- **Cross-linked hyaluronic acid–containing gels.** These gels are epitheliotropic and have bacteriostatic antimicrobial properties.[49] To date, no studies have evaluated the efficacy of sodium hyaluronate–containing lubricants alone as prophylaxis for corneal ulcers in comparison with topical antibiotics.
- **Ocular-specific antiseptic formulations.** In vitro studies have demonstrated the efficacy of antiseptics against common pathogens involved in secondary bacterial infection of feline corneal ulcers, but follow-up in vivo studies are needed to demonstrate tolerability and efficacy.[29] Available products contain 0.01% hypochlorous acid (e.g., Vetericyn Plus, Innovacyn) or 0.05% to 0.1% hexamidine diisethionate ± 0.0001% polyhexanide hydrochloride (e.g., Desomedine; Septostil, Trebifarma).[29,50] Septostil, available in Europe, has been shown to be as effective as topical cefazolin at reducing the risk of infection after diamond burr debridement in dogs.[50]

Infected Ulcers

Dual antibiotic therapy is typically necessary to cover for common gram-positive bacteria such as *Staphylococcus* and *Streptococcus* species (e.g.,

chloramphenicol 0.5% to 1% solution, cefazolin 5% solution compounded from intravenous cefazolin vials) and gram-negative bacteria such as *Pasteurella* or *Pseudomonas* species (e.g., tobramycin or gentamicin 0.3% solution, ofloxacin or ciprofloxacin 0.3%). Initial dosing should be frequent (every 1 to 2 hours) for the first 24 to 72 hours to rapidly saturate the cornea and control infection, tapering once infection is controlled. Avoid antibiotic ointment formulations, since there is an increased risk of rupture from traumatic application and risk of granulomatous uveitis should the ointment enter the eye.

Systemic Antibiotics

Systemic antibiotics are rarely indicated for ulcers since they do not reach the infected site in the avascular cornea but may be justified in cases of perforation, deep ulcers at risk of rupture, or neovascularization reaching the infection site.

An exception is oral doxycycline, which is released in tears to reach the ocular surface; however, because the minimum inhibitory concentrations are lower than those of the most common corneal pathogens, its use is not recommended for antibiosis.[51] It does have anticollagenolytic benefits, but equally effective nonantibiotic options are preferred (e.g., topical EDTA >0.3%, serum/plasma, *N*-acetylcysteine >0.5%) for antibiotic stewardship.[52] *N*-Acetylcysteine is useful because it has biofilm-disrupting and broad-spectrum antimicrobial benefits.[29,48] Dose topical anticollagenolytics every 1 to 2 hours until keratomalacia is controlled, then taper.

Adjunctive and Surgical Treatments

Noninvasive adjuncts to both medical and surgical management of infected or melting ulcers include corneal collagen cross-linking,[53] which helps kill microorganisms rapidly and stabilize malacic cornea, and ultraviolet C light treatment, which kills microorganisms rapidly.[54]

Anecdotally, surgical stabilization may be indicated for ulcers exceeding 50% stromal depth to prevent rupture. A general rule is that if an ulcer has a concavity, it is at least 50% stromal depth. The surgical procedure typically involves keratectomy of necrotic and infected tissue. This excision of infected tissue facilitates rapid control of infection. The defect is then grafted for tectonic support. Graft options include autologous tissue (e.g., conjunctival pedicle grafts, corneoconjunctival transpositions) and biomaterials (e.g., amnion, porcine small intestinal mucosa). For deep, heavily infected ulcers, conjunctival pedicle grafts are ideal as they provide a direct blood supply, delivering endogenous antibiotic and anticollagenolytic factors. Notably, cats maintain superior corneal clarity postoperatively compared to dogs, especially if collagen-based or amniotic grafts are used rather than conjunctiva (**FIGURE 14**).[55-57]

Even with severe, deep, or perforated infected ulcers managed only medically, cats can have excellent outcomes.[58] Compared to dogs with an equivalent ulcer, cats generally have a superior ability to heal. Hospitalization for intensive antibiotic therapy is recommended if owners cannot medicate at home and can be useful for close monitoring of a rapidly progressive ulcer. Enucleation is reserved for irreversibly blind eyes or to relieve pain in cases that do not improve after a week of intensive medical therapy.

Manage Pain

Effective analgesia is typically multimodal and maintained for the ulcer duration. There are no studies that specifically evaluate the efficacy of available feline pain medications for the treatment of corneal ulcer pain; therefore, this is an area where further research is needed. Instead, pain management targets corneal nerve pain and painful ciliary muscle spasm from reflex uveitis. Options include:

1. **Oral NSAIDs (e.g., low-dose meloxicam):** Effective for corneal pain and associated reflex uveitis.
2. **Topical cycloplegics (e.g., 1% atropine):** Controls ciliary spasm and stabilizes the blood–aqueous barrier. Dose every 24 to 48 hours for noninfected ulcers or every 8 to 12 hours initially for infected ulcers, tapering once mydriasis is achieved.
3. **Opioids (e.g., transmucosal buprenorphine):** Useful for severe pain, after debridement, or following surgery.
4. **Adjuncts (e.g., gabapentin, pregabalin):** May have benefits for corneal nerve pain, although analgesic efficacy and onset can be unpredictable; it may be best not to rely on as monotherapy.[59] Anxiolytic effects may be useful during the treatment period.

Support Healing

While rigid plastic Elizabethan collars are standard for dogs, they should be used selectively in cats, primarily for fragile eyes or if self-trauma is observed. Since many feline ulcers are herpetic, the stress of a collar can exacerbate the condition and, in the authors' experience, cats are less likely than dogs to self-traumatize. Avoid use of the following:

- **Corticosteroids:** Topical use is strictly contraindicated in any cat with a corneal ulcer. If fluorescein stain uptake is seen *over* a white plaque in a cat with eosinophilic keratitis, this is not true corneal ulceration and therefore topical steroids can be used to treat this immune-mediated disease; systemic use should also be avoided as it can contribute to FHV-1 reactivation or persistence.
- **Topical NSAIDs:** Generally avoid due to delayed healing, except when managing primary uveitis with secondary ulceration; for example, if a cat being treated with topical corticosteroids for uveitis has developed an ulcer from herpesvirus recrudescence. In such cases, switch to a topical NSAID to control the uveitis and stop the corticosteroid.
- **Polymyxin-containing products:** Linked to rare but potentially fatal anaphylaxis in cats.[60]
- **Long-term (i.e., > 2 to 3 weeks) ointment use**: Due to hypersensitivity concerns.[43]
- **Ointment use in deep or infected ulcers:** Due to challenges in administration and risk of granulomatous uveitis if the ointment enters the eye.
- **Overtreatment:** Excessive medications increase stress, promoting FHV-1 persistence. A minimalist protocol with only essential medications (e.g., antivirals, antimicrobials, pain management with or without lubrication when indicated) is preferred.

Prognosis

The prognosis for feline ulcers depends on the cause, duration, presence of infection, depth, and treatment choice.

Acute superficial ulcers typically heal within 5 to 7 days once the etiology is corrected. If there is concern for FHV-1, prompt antiviral therapy and CTA debridement of any loose epithelium are vital. Healing of FHV-1 ulcers can be more protracted. Recheck within 7 days to confirm resolution.

In cats with chronic superficial ulcers, loose epithelium requires intervention (e.g., CTA or diamond burr debridement, superficial keratectomy). Healing usually occurs within 2 weeks after the procedure; recalcitrant cases may take 4 to 6 weeks.[36,38] Superficial keratectomy is the most successful surgical option; however, its disadvantages include the need for general anesthesia, higher costs, and the fact that the surgery involves the removal of approximately 20% of the corneal thickness.[36,37] Therefore, it is not appropriate for every patient.[36,37] Recheck every 10 to 14 days postprocedure.

FHV-1 is never cured; rather, it returns to dormancy. Therefore, stress-induced flare-ups and recurrent ulcers are common, especially in immunosuppressed, stressed, or systemically ill patients.[36]

FIGURE 14. Excellent postoperative clarity in a cat 1 year after conjunctival pedicle graft for a deep, infected ulcer.

FIGURE 15. Severe corneal opacification in a cat secondary to corneoconjunctival symblepharon formation after severe primary herpesvirus ulcerative disease as a kitten. Note the veils of opaque and vascularized tissue covering the cornea.

In cats with bacterial infectious keratitis, the risk of rupture increases with ulcer depth. Surgical stabilization offers the most predictable outcomes, although many can heal with medical management alone.[58] Monitor every 1 to 2 days until stable.

Common Complications

Ulcer Persistence

There is an impetus for rapid healing of feline ulcers. Delayed antiviral treatment for herpetic ulcers can lead to stalled healing and chronic ulcers that require intervention to obtain healing (e.g., diamond burr debridement, superficial keratectomy).

Fibrosis

Superficial ulcers typically heal without corneal fibrosis (scarring), whereas stromal ulcers result in disorganized collagen that leaves a gray-white opacity. While larger, deeper, or central scars impact vision more significantly, they can fade over time as collagen remodels. Notably, cats maintain corneal clarity after injury or surgery far better than dogs.[55-57]

Corneal Sequestrum

This is a complication unique to cats, common with ulcers that fail to heal rapidly.[36,61] It is an area of necrotic, amber to black cornea triggered by chronic corneal irritation (**FIGURES 3, 10, AND 11**). Controlled surgical excision of the corneal sequestrum and associated nonhealing ulcer is the preferred treatment, with additional grafting indicated if the excision bed is deep.[61] Medical management is the alternative, waiting for the sequestrum to slough; however, this can take weeks to months and may result in persistent pain. Additionally, sequestra can deepen and enlarge, risking perforation after sloughing.[61] Proactive intervention to promote rapid healing of feline ulcers is vital to prevent sequestrum formation. Unlike dogs, cats rarely develop pigmentary keratitis after corneal ulceration; they tend to form sequestra where a dog would develop pigmentary keratitis.

FIGURE 16. Corneal opacity secondary to corneal fibrosis and anterior synechiae (iris adhered to cornea) in a cat that was previously treated only medically for a perforated, infected corneal ulcer. The iris plugged the corneal defect at the time of perforation and became incorporated in the cornea during healing.

Corneoconjunctival Symblepharon

Corneoconjunctival symblepharon occurs when concurrent corneal and conjunctival ulceration causes apposed, inflamed surfaces to scar together, resulting in conjunctival bands or sheets covering the cornea (**FIGURE 15**). This complication typically follows primary FHV-1 infection in kittens.

Globe Perforation and Endophthalmitis

Globe perforation is a risk of infected ulcers. The deeper, wider, and more malacic the ulcer, the greater the risk. Surgical repair may restore integrity if a rupture occurs, and some ruptures can even heal medically if the defect is small enough to be stabilized by coagulated fibrin and/or iris (**FIGURE 16**).[58] However, rupture can allow bacterial entry, potentially leading to endophthalmitis that often requires enucleation due to intractable inflammation and secondary glaucoma.

Summary

Appropriate corneal ulcer treatment in cats requires accurate diagnosis and prompt treatment of the underlying etiology (e.g., herpesvirus, dry eye, entropion), careful monitoring for complications (e.g., bacterial corneal infection, corneal sequestrum) and intervention should they develop, and variations in the medical and surgical treatment protocol depending on the type of ulcer (e.g., acute herpetic ulcer, superficial noninfected ulcer with loose epithelial edges, infected ulcer). TVP

References

1. Alario AF, Pirie CG. Central corneal thickness measurements in normal dogs: a comparison between ultrasound pachymetry and optical coherence tomography. *Vet Ophthalmol*. 2014;17(3):207-211. doi:10.1111/vop.12074
2. Telle MR, Chen N, Shinsako D, et al. Relationship between corneal sensitivity, corneal thickness, corneal diameter, and intraocular pressure in normal cats and cats with congenital glaucoma. *Vet Ophthalmol*. 2019;22(1):4-12. doi:10.1111/vop.12558
3. Verdenius CY, Broens EM, Slenter IJM, Djajadiningrat-Laanen SC. Corneal stromal ulcerations in a referral population of dogs and cats in the Netherlands (2012–2019): bacterial isolates and antibiotic resistance. *Vet Ophthalmol*. 2024;27(1):7-16. doi:10.1111/vop.13080
4. Lin CT, Petersen-Jones SM. Antibiotic susceptibility of bacteria isolated from cats with ulcerative keratitis in Taiwan. *J Small Anim Pract*. 2008;49(2):80-83. doi:10.1111/j.1748-5827.2007.00437.x
5. Goldreich JE, Franklin-Guild RJ, Ledbetter EC. Feline bacterial keratitis: clinical features, bacterial isolates, and in vitro antimicrobial susceptibility patterns. *Vet Ophthalmol*. 2020;23(1):90-96. doi:10.1111/vop.12693
6. Suter A, Voelter K, Hartnack S, Spiess BM, Pot SA. Septic keratitis in dogs, cats, and horses in Switzerland: associated bacteria and antibiotic susceptibility. *Vet Ophthalmol*. 2018;21(1):66-75. doi:10.1111/vop.12480
7. Frejlich M, Payen G. Prevalence and characteristics of feline ulcerative keratitis and corneal sequestra in a referral population and comparison between brachycephalic and nonbrachycephalic cats. *Vet Ophthalmol*. 2025;29(2):e70048. doi:10.1111/vop.70048
8. Park J, Kang S, Lee E, Seo K. Prevalence of feline ophthalmic disorders in South Korea: a retrospective study (2009–2021). *J Feline Med Surg*. 2023;25(2):1098612X231151478. doi:10.1177/1098612X231151478
9. Pierce KE, Wilkie DA, Gemensky-Metzler AJ, et al. An association between systemic cyclosporine administration and development of acute bullous keratopathy in cats. *Vet Ophthalmol*. 2016;19(S1):77-85. doi:10.1111/vop.12367
10. Pederson SL, Pizzirani S, Andrew SE, Pate DO, Stine JM, Michau TM. Use of a nictitating membrane flap for treatment of feline acute corneal hydrops-21 eyes. *Vet Ophthalmol*. 2016;19(S1):61-68. doi:10.1111/vop.12353
11. Anderson C, Zhou Q, Wang S. An alkali-burn injury model of corneal neovascularization in the mouse. *J Vis Exp*. 2014;(86):51159. doi:10.3791/51159
12. Sebbag L, Kass PH, Maggs DJ. Reference values, intertest correlations, and test-retest repeatability of selected tear film tests in healthy cats. *JAVMA*. 2015;246(4):426-435. doi:10.2460/javma.246.4.426
13. Uhl LK, Saito A, Iwashita H, Maggs DJ, Mochel JP, Sebbag L. Clinical features of cats with aqueous tear deficiency: a retrospective case series of 10 patients (17 eyes). *J Feline Med Surg*. 2019;21(10):944-950. doi:10.1177/1098612X18810867
14. Schlesener BN, Scott EM, Vallone LV. An unusual case of feline acute corneal hydrops: atypical disease presentation and possible in vivo detection of Descemet's membrane detachment in the cat's unaffected eye. *Vet Ophthalmol*. 2018;21(4):426-431. doi:10.1111/vop.12527
15. Cullen CL, Mjaa BL, Grahn BH. Ulcerative keratitis associated with qualitative tear film abnormalities in cats. *Vet Ophthalmol*. 1999;2(3):197-204. doi:10.1046/j.1463-5224.1999.00082.x
16. Sigmund AB, Ward DA, Cox SK, Hendrix DVH. Tear film concentrations of topically applied 0.5% oxytetracycline ointment in normal canine eyes. *Vet Ophthalmol*. 2020;23(4):707-713. doi:10.1111/vop.12783
17. Chitsaz S, Avizeh R, Najafzadeh Varzi H, Baniadam A. Comparison of serum oxytetracycline concentration after intravenous and intraosseous administration in dogs. *Iranian Vet J*. 2023;19(3):23-28. doi:10.22055/ivj.2023.365433.2511
18. Maggs DJ, Clarke HE. Relative sensitivity of polymerase chain reaction assays used for detection of feline herpesvirus type 1 DNA in clinical samples and commercial vaccines. *Am J Vet Res*. 2005;66(9):1550-1555. doi:10.2460/ajvr.2005.66.1550
19. Sjödahl-Essén T, Tidholm A, Thorén P, et al. Evaluation of different sampling methods and results of real-time PCR for detection of feline herpes virus-1, *Chlamydophila felis* and *Mycoplasma felis* in cats. *Vet Ophthalmol*. 2008;11(6):375-380. doi:10.1111/j.1463-5224.2008.00661.x
20. Rampazzo A, Appino S, Pregel P, Tarducci A, Zini E, Biolatti B. Prevalence of *Chlamydophila felis* and feline herpesvirus 1 in cats with conjunctivitis in northern Italy. *J Vet Intern Med*. 2003;17(6):799-807. doi:10.1111/j.1939-1676.2003.tb02517.x
21. Thomasy SM, Shull O, Outerbridge CA, et al. Oral administration of famciclovir for treatment of spontaneous ocular, respiratory, or dermatologic disease attributed to feline herpesvirus type 1: 59 cases (2006–2013). *JAVMA*. 2016;249(5):526-538. doi:10.2460/javma.249.5.526
22. Lewin AC, Liu CC, Alling C, Camacho-Luna P, Miessler B, Carter RT. In vitro efficacy of ganciclovir against feline herpesvirus type 1 and assessment of ocular tolerability in healthy cats. *J Feline Med Surg*. 2021;23(4):400-404. doi:10.1177/1098612X20944363
23. Ledbetter EC, Badanes ZI, Chan RX, et al. Comparative efficacy of topical ophthalmic ganciclovir and oral famciclovir in cats with experimental ocular feline herpesvirus-1 epithelial infection. *J Ocul Pharmacol Ther*. 2022;38(5):339-347. doi:10.1089/jop.2022.0001
24. Ledbetter EC, Morgan AJ. Frequency and characterization of local ocular toxicity in cats treated with topical ophthalmic cidofovir for presumptive feline herpesvirus-1 infection. *Vet Ophthalmol*. 2026;29(1):e70046. doi:10.1111/vop.70046
25. Fontenelle JP, Powell CC, Veir JK, Radecki SV, Lappin MR. Effect of topical ophthalmic application of cidofovir on experimentally induced primary ocular feline herpesvirus-1 infection in cats. *Am J Vet Res*. 2008;69(2):289-293. doi:10.2460/ajvr.69.2.289
26. Ledbetter EC, Ramos-Bartolomei AM, Brito FLC, et al. Evaluation of topical ophthalmic application of penciclovir cream in cats with experimental ocular feline herpesvirus-1 infection. *Am J Vet Res*. 2026;87(3):ajvr.25.08.0304. doi:10.2460/ajvr.25.08.0304
27. Pe'er O, Thomasy SM, Feuer E, Knych HK, Ofri R, Sebbag L. Ocular tolerance and tear film pharmacokinetics of 1% penciclovir cream in cats. *Res Vet Sci*. 2025;196:105909. doi:10.1016/j.rvsc.2025.105909
28. Stiles J. Treatment of cats with ocular disease attributable to herpesvirus infection: 17 cases (1983-1993). *JAVMA*. 1995;207(5):599-603.
29. Wolff HT, Piroth AC, Oltmanns H, et al. Commercially available antiseptics show high in vitro efficacy against pathogens most commonly associated with canine and feline infectious keratitis. *Front Vet Sci*. 2025;12:1552230. doi:10.3389/fvets.2025.1552230
30. Pennington MR, Capriotti JA, Van de Walle GR. In vitro efficacy of povidone iodine and hydroxyethyl cellulose, alone and in combination, against common feline ocular pathogens. *Vet J*. 2018;241:38-41. doi:10.1016/j.tvjl.2018.09.011
31. Maggs DJ, Collins BK, Thorne JG, Naisisse MP. Effects of L-lysine and L-arginine on in vitro replication of feline herpesvirus type-1. *Am J Vet Res*. 2000;61(12):1474-1478. doi:10.2460/ajvr.2000.61.1474
32. Stiles J, Townsend WM, Rogers QR, Krohne SG. Effect of oral administration of L-lysine on conjunctivitis caused by feline herpesvirus in cats. *Am J Vet Res*. 2002;63(1):99-103. doi:10.2460/AJVR.2002.63.99
33. Cave NJ, Dennis K, Gopakumar G, Dunowska M. Effects of physiologic concentrations of l-lysine on in vitro replication of feline herpesvirus 1. *Am J Vet Res*. 2014;75(6):572-580. doi:10.2460/ajvr.75.6.572

34. Drazenovich TL, Fascetti AJ, Westermeyer HD, et al. Effects of dietary lysine supplementation on upper respiratory and ocular disease and detection of infectious organisms in cats within an animal shelter. *Am J Vet Res*. 2009;70(11):1391-1400. doi:10.2460/ajvr.70.11.1391
35. La Croix NC, van der Woerdt A, Olivero DK. Nonhealing corneal ulcers in cats: 29 cases (1991-1999). *JAVMA*. 2001;218(5):733-735. doi:10.2460/javma.2001.218.733
36. Rujirekasuwan N, Sattasathuchana P, Sritrakoon N, Thengchaisri N. Recurrent vs. nonrecurrent superficial non-healing corneal ulcers in cats: a multifactorial retrospective analysis. *Animals (Basel)*. 2025;15(14):2104. doi:10.3390/ani15142104
37. Jégou JP, Tromeur F. Superficial keratectomy for chronic corneal ulcers refractory to medical treatment in 36 cats. *Vet Ophthalmol*. 2015;18(4):335-340. doi:10.1111/vop.12153
38. Anastassiadis Z, Bayley KD, Read RA. Corneal diamond burr debridement for superficial non-healing corneal ulcers in cats. *Vet Ophthalmol*. 2022;25(6):476-482. doi:10.1111/vop.13026
39. Bossuyt SM. The use of therapeutic soft contact bandage lenses in the dog and the cat: a series of 41 cases. *Vlaams Diergeneeskd Tijdschr*. 2016;85(6):343-348. https://doi.org/10.21825/vdt.v85i6.16308
40. Dees DD, Fritz KJ, Wagner L, Paglia D, Knollinger AM, Madsen R. Effect of bandage contact lens wear and postoperative medical therapies on corneal healing rate after diamond burr debridement in dogs. *Vet Ophthalmol*. 2017;20(5):382-389. doi:10.1111/vop.12412
41. White JS, Grundon RA, Hardman C, O'Reilly A, Stanley RG. Surgical management and outcome of lower eyelid entropion in 124 cats. *Vet Ophthalmol*. 2012;15(4):231-235. doi:10.1111/j.1463-5224.2011.00974.x
42. McDonald JE, Knollinger AM. The use of hyaluronic acid subdermal filler for entropion in canines and felines: 40 cases. *Vet Ophthalmol*. 2019;22(2):105-115. doi:10.1111/vop.12566
43. Eördögh R, Schwendenwein I, Tichy A, Loncaric I, Nell B. Clinical effect of four different ointment bases on healthy cat eyes. *Vet Ophthalmol*. 2016;19(S1):4-12. doi:10.1111/vop.12279
44. Grego AL, Fankhauser AD, Behan EK, et al. Comparative fluorophotometric evaluation of the ocular surface retention time of cross-linked and linear hyaluronic acid ocular eye drops on healthy dogs. *Vet Res Commun*. 2024;48(6):4191-4199. doi:10.1007/s11259-024-10559-x
45. AWaRe classification of antibiotics for evaluation and monitoring of use, 2023. World Health Organization. July 26, 2023. Accessed June 30, 2026. https://www.who.int/publications/i/item/WHO-MHP-HPS-EML-2023.04
46. Schmerold I, Geijlswijk Iv, Gehring R. European regulations on the use of antibiotics in veterinary medicine. *Eur J Pharm Sci*. 2023;189:106473. doi:10.1016/j.ejps.2023.106473
47. Frey E, Costin M, Granick J, Kornya M, Weese JS. 2022 AAFP/AAHA antimicrobial stewardship guidelines. *JAAHA*. 2022;58(4):1-5. doi:10.5326/1547-3317-58.4.1
48. Walter H, Verspohl J, Meißner J, Oltmanns H, Geks AK, Busse C. In vitro antimicrobial activity of N-acetylcysteine against pathogens most commonly associated with infectious keratitis in dogs and cats. *Antibiotics (Basel)*. 2023;12(3):559. doi:10.3390/antibiotics12030559
49. Williams DL, Wirostko BM, Gum G, Mann BK. Topical cross-linked HA-based hydrogel accelerates closure of corneal epithelial defects and repair of stromal ulceration in companion animals. *Invest Ophthalmol Vis Sci*. 2017;58(11):4616-4622. doi:10.1167/iovs.16-20848
50. Gimenez E, Crasta M. Comparision between the use of topical antibiotic and Septostil in spontaneous chronic corneal epithelial defects in dogs. *Vet Ophthalmol*. 2026;29(2):e70114. doi:10.1111/vop.70114
51. Sebbag L, Showman L, McDowell EM, Perera A, Mochel JP. Impact of flow rate, collection devices, and extraction methods on tear concentrations following oral administration of doxycycline in dogs and cats. *J Ocul Pharmacol Ther*. 2018;34(6):452-459. doi:10.1089/jop.2018.0008
52. Kimmitt BA, Moore GE, Stiles J. Comparison of the efficacy of various concentrations and combinations of serum, ethylenediaminetetraacetic acid, tetracycline, doxycycline, minocycline, and N-acetylcysteine for inhibition of collagenase activity in an in vitro corneal degradation model. *Am J Vet Res*. 2018;79(5):555-561. doi:10.2460/ajvr.79.5.555
53. Crasta M, Gimenez E, Ostan PC, Arteaga K. Photoactivated chromophore for keratitis—corneal cross-linking in dogs and cats: a retrospective study in Italy. *Vet Ophthalmol*. 2025;28(2):413-424. doi:10.1111/vop.13284
54. Turicea B, Sahoo DK, Allbaugh RA, Stinman CC, Kubai MA. Novel treatment of infectious keratitis in canine corneas using ultraviolet C (UV-C) light. *Vet Ophthalmol*. 2025;28(4):699-713. doi:10.1111/vop.13265
55. Chow DWY, Westermeyer HD. Retrospective evaluation of corneal reconstruction using ACell Vet(™) alone in dogs and cats: 82 cases. *Vet Ophthalmol*. 2016;19(5):357-366. doi:10.1111/vop.12294
56. Maini S, Hurley-Bennett K, Dawson C. Case series describing the use of low-temperature vacuum-dehydrated amnion (Omnigen) for the treatment of corneal ulcers in cats and dogs: 46 cases (2016-2017). *Top Companion Anim Med*. 2020;41:100474. doi:10.1016/j.tcam.2020.100474
57. Goulle F. Use of porcine small intestinal submucosa for corneal reconstruction in dogs and cats: 106 cases. *J Small Anim Pract*. 2012;53(1):34-43. doi:10.1111/j.1748-5827.2011.01149.x
58. Bustamante MGMd, Good KL, Leonard BC, et al. Medical management of deep ulcerative keratitis in cats: 13 cases. *J Feline Med Surg*. 2018;21(4):387-393. doi:10.1177/1098612X18770514

EARN CE CREDIT

Feline Corneal Ulcers: Diagnosis and Management

SCAN THE QR CODE to take the quiz for free on VetFolio

This article has been submitted for **RACE approval for 1 hour of continuing education credit** and will be opened for enrollment upon approval. To receive credit, take the test at **vetfolio.com** by searching the name of the article or scanning the QR code.

- Free registration is required.
- Questions and answers online may differ from those below.
- Tests are valid for 2 years from the date of approval.

CE Quiz Questions

1. **What is the most likely etiology of a corneal ulcer in a cat if no other abnormalities are found on ocular examination?**
   a. Trauma
   b. Bacterial infection
   c. Feline herpesvirus 1 (FHV-1)
   d. Tear deficiency

2. **Which of the following findings is most indicative of a chronic corneal process?**
   a. Blepharospasm
   b. Corneal neovascularization
   c. Corneal edema
   d. Conjunctival hyperemia

3. **Which of the following is the best initial antibiotic treatment for a noninfected superficial corneal ulcer in a cat?**
   a. Topical fluoroquinolone every hour
   b. Topical erythromycin ointment 2 to 4 times daily
   c. Systemic antibiotic
   d. Topical fluoroquinolone 2 to 4 times daily

4. **A cat with suspected FHV-1 corneal ulceration is being treated. How long should antiviral therapy generally be continued after the ulcer has healed?**
   a. 1 to 2 weeks beyond clinical resolution
   b. Until fluorescein stain is negative
   c. Until clinical signs improve
   d. Indefinitely

5. **Which of the following is contraindicated in cats with superficial, nonhealing ulcers with loose epithelium?**
   a. Cotton-tipped applicator debridement
   b. Diamond burr debridement
   c. Superficial keratectomy
   d. Grid keratotomy

59. Ciccarelli S, Perrone C, Forte L, Di Bello A, Franchini D. Efficacy of gabapentin as pain management of T2–T4 feline facial squamous cell carcinoma treated with electrochemotherapy. *Sci Rep*. 2025;15(1):27874. doi:10.1038/s41598-025-13767-w
60. Hume-Smith KM, Groth AD, Rishniw M, Walter-Grimm LA, Plunkett SJ, Maggs DJ. Anaphylactic events observed within 4 h of ocular application of an antibiotic-containing ophthalmic preparation: 61 cats (1993–2010). *J Feline Med Surg*. 2017;13(10):744-751. doi:10.1016/j.jfms.2011.06.007
61. Gómez AP, Mazzucchelli S, Smith K, de Lacerda RP. Long-term treatment outcomes and risk factors for recurrence in feline corneal sequestrum: 72 cases (2009–2017). *Vet Rec*. 2023;193(3):e2783. doi:10.1002/vetr.2783

Authors

Louise O'Leary

Dr. O'Leary is a veterinary ophthalmologist at University College Dublin School of Veterinary Medicine, Ireland. She has also been a VIN.com consultant since 2024. She received her MVB degree from University College Dublin in 2017, followed by a small animal rotating internship at the University of Florida and a comparative ophthalmology residency at Iowa State University. Her clinical interests include antibiotic stewardship, corneal disease, and uveitis in all species. Her research interests include ocular analgesia, novel therapeutics, and simulator development for improving ophthalmology education.

Inês Mesquita

Dr. Mesquita is a small animal rotating intern at the University College Dublin School of Veterinary Medicine. She graduated from the University of Évora, Portugal, in 2022 and completed an ophthalmology internship at Lisbon Vet Specialists. With a strong interest in veterinary ophthalmology, she is committed to advancing her clinical skills through continuous learning and professional development.