FHV-1 AND EYE DISEASE IN THE CAT

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Feline herpes virus 1 (FHV-1) infection is a very common infection in cats. FHV-1 is an alpha herpes virus. Primary infection with feline herpes virus manifests itself usually in the respiratory tract and the eyes. Clinical signs include lethargy, fever, sneezing, nasal and ocular discharge, conjunctival hyperemia and chemosis. One or both eyes may be affected. Dendritic corneal ulcerations represent viral replication within the corneal epithelium. Corneal lesions are most common on days 3 and 12 of the primary infection. Dendritic ulcers may coalesce to form larger geographic ulcerations. Secondary bacterial infection may lead to deep corneal ulceration or corneal perforation with iris prolapse and anterior synechiae formation. Adhesions between third eyelid and the cornea or eyelids may lead to permanent protrusion of the third eyelid. The corneal epithelium may be replaced by conjunctival-like epithelium that contains blood vessels and is not completely transparent. Approximately 80% of cats infected with FHV-1 will become carriers of the virus after the initial infection. Spontaneous shedding occurs in 30% of cats. Recrudescent infections frequently involve the eyes only. Conjunctivitis with or without keratitis lasting from a few days to several weeks is seen. Epithelial and Stromal keratitis with cellular infiltration and edema may be seen in recrudescent infections.

DIAGNOSIS OF FELINE HERPES VIRUS INFECTION

Feline herpes virus infection should be suspected in any young cat with uni- or bilateral conjunctivitis with corneal involvement. The presence of dendritic ulcerations is considered pathognomonic for FHV-1 infection. Especially in recrudescent infections, dendritic ulcers are often absent.

Laboratory methods used in the diagnosis of FHV-1 infection include serum antibody titers by serum neutralization or ELISA, virus isolation, immunofluorescent assay or PCR assay. Diagnosis of FHV-1 infection may be difficult. Serum antibody titers against FHV-1 were found in 97% of normal cats and cats with conjunctivitis in one study, indicating that single or paired FHV-1 antibody titers are not useful in the diagnosis of FHV-1 infection. Sample handling for virus isolation is difficult and the test takes over a week to perform, making this test of limited use in clinical practice. Immunofluorescent assay performed on a conjunctival scrape detected only few affected cats in one study. False positive results may occur if the sample is taken from the eye after application of topical fluorescein. Polymerase Chain Reaction assay is a very sensitive method of detecting even limited amounts of DNA. Samples, once collected, should be frozen. Chances of obtaining a positive result are better when more cellular material is submitted.

TREATMENT OF FELINE HERPES VIRUS INFECTION

Conjunctivitis without ulcerative corneal disease can be treated with topical antibiotic therapy only. The disease is self-limiting and lasts less than 2 weeks in most otherwise healthy cats. Antiviral medications are indicated in cats with ulcerative corneal disease, or in cats with a compromised immune system. Examples of antiviral medications, in decreasing order of potency include trifluridine, idoxuridine and vidarabine. Antiviral medications need to be used frequently in order to be effective. Ciprofloxacin topically may need to be used in infected corneal ulcers. Systemic antiviral medications are used infrequently in cats because of limited efficacy (Acyclovir) or pronounced toxicity (Valacyclovir). The ED50 of acyclovir for treatment of FHV-1 is very high, however this can be lowered by combining acyclovir with interferon.

The immune system is important in controlling a FHV-1 infection. L-lysine is an essential amino-acid that has been shown to significantly reduce virus shedding in affected cats and decrease the duration of FHV-1 infection. It suppresses FHV-1 replication by competing with arginine for incorporation into the viral genome. Dose of L-lysine used in various studies varies between 250 mg once a day to 500 mg twice a day over the food. Parenteral vaccination with FHV-1 vaccines is not recommended in the treatment of FHV-1 infection. Intranasal and ocular application of modified live FHV-1 vaccine stimulates a mucosal immune response and local antibody production. This may result in some improvement in cats with chronic low-grade FHV-1 conjunctivitis. This should not be done in cats with stromal keratitis.

Recrudescence infections are initiated by a temporary reduction in the immune system allowing the virus to become active again. Stressful situations will often precipitate recrudescent infections. Reducing or preferably eliminating stressful situations will aid in the recovery of FHV-1 infection.

COMPLICATIONS SECONDARY TO FELINE HERPES VIRUS INFECTION

Chronic epiphora may persist after the conjunctivitis resolves. Chronic epiphora may be secondary to symblepharon formation in the area of the nasolacrimal punctae, or stricture of the nasolacrimal system. Attempts to irrigate the nasolacrimal system are usually unsuccessful. Symblepharon formation is common after severe infections. Minor adhesions between eyelids and third eyelid or between conjunctiva and cornea can be surgically corrected under general anesthesia. Extensive symblepharon formation is difficult to correct surgically and recurrences are common.

KERATOCONJUNCTIVITIS SICCA

The most common etiology of keratoconjunctivitis sicca (KCS) in dogs is an immune-mediated destruction of the lacrimal gland. It may result in severe corneal scarring and pigmentation in the dog. Blindness may occur if the disease is not treated or is unresponsive to therapy.
Keratoconjunctivitis Sicca is uncommon in cats. The most common etiology in cats is destruction of the lacrimal gland by FHV-1 infection. The diagnosis of KCS can be difficult in cats. Clinical signs can be subtle and may include blepharospasm, conjunctival hyperemia and mucoid discharge. The severe corneal changes that may be present in dogs such as vascularization, fibrosis and pigmentation are usually absent in cats. The tear production can be measured using Schirmer Tear Test strips, but the results should be interpreted with caution. Treatment consists of artificial tear solution 2-4 times a day with artificial tear ointment once or twice a day. Intermittent use of topical antibiotics is occasionally necessary to treat secondary infections. Topical cyclosporine has not been approved for use in cats and its use is not recommended for treatment of KCS in cats.

**EOSINOPHILIC KERATITIS AND CONJUNCTIVITIS**

Eosinophilic keratitis is a disease that is unique for cats. It is an immune-mediated inflammatory disease of the cornea. It most commonly affects young adult, mixed breed cats. There is often little discomfort present. The disease often starts near the lateral or ventromedial limbus, and may affect one or both eyes. Typical clinical findings include vascularization and infiltration of the perilimbal cornea, presence of gritty, white corneal plaques, inflammation of the adjacent conjunctiva and third eyelid and ocular discharge. The diagnosis can be confirmed by cytologic examination of a corneal scrape specimen using a Kimura spatula. Eosinophils and mast cells are present. Treatment consists of topical corticosteroids such as 1% prednisolone acetate or 1% prednisolone phosphate. These medications are used initially 2-4 times a day until all clinical signs disappear and then slowly discontinued over months. Recurrences are common, especially if medications are discontinued too quickly. Systemic megestrol acetate can be used if ulcerative keratitis is present.

Eosinophilic conjunctivitis is seen infrequently. Clinical signs include thickening and hyperemia of the conjunctiva and ocular discharge. Depigmentation and ulceration of the eyelid margins and nasal canthus is seen in some cats. The cornea is not affected. Diagnosis and treatment are as for eosinophilic keratitis.

Feline herpes virus infection has been shown to be present in a large number of cats with eosinophilic keratitis. Its exact role in the pathogenesis of the disease is still unknown. Topical use of corticosteroids in treatment of eosinophilic keratitis may reactivate latent FHV-1 virus resulting in FHV-1 keratitis. Treatment with antiviral medications needs to be started and topical steroid use discontinued until the FHV-1 keratitis has resolved. It has been suggested to use both antiviral medications and corticosteroids in the treatment of eosinophilic keratitis, but this is still debated.

**NON-HEALING CORNEAL ULCERATIONS**

Indolent corneal ulcers are superficial nonhealing corneal ulcers that are characterized by redundant epithelial edges. They are commonly seen in Boxer dogs and older dogs of any breed. Superficial corneal ulcers resembling indolent ulcers are seen in cats. Clinical signs include mild blepharospasm, epiphora, conjunctival hyperemia and a superficial corneal ulcer with redundant epithelial edges. In one study, the most common location was the central cornea, and brachycephalic cats appeared to be predisposed. Average healing time was 5-6 weeks when topical antibiotic solution or ointment was used in combination with superficial debridement. Treatment of an indolent ulcer in dogs frequently involves performing a procedure to expose healthy underlying stroma, such as grid or punctate keratotomy. In contrast to dogs, performing a grid keratotomy did not decrease healing time in cats and it appeared to predispose to the development of a corneal sequestrum. Feline herpes virus infection may cause non-healing geographic corneal ulcerations. If signs of active FHV-1 infection are present, such as pronounced conjunctival hyperemia and chemosis, the use of topical antiviral medications may be indicated in the treatment of superficial non-healing ulcers in cats.

Qualitative tear film abnormalities have been associated with non-healing corneal ulcers in cats. Measurement of tear break-up time can be performed in cats. If tear break-up time is rapid in affected cats, mucinomimetic supplementation may aid in the healing of nonhealing ulcers.

**CORNEAL SEQUESTRUM**

Corneal sequestrum is a corneal disease unique to cats. Persian, Himalayan, Burmese and Siamese cats are predisposed. It is a localized necrosis of the epithelium and anterior stroma. The affected area gets infiltrated with dark pigment that is present in the tear film resulting in the characteristic black lesion in the cornea. Sequestra are often located in the (para) central cornea. A rim of loose epithelium is frequently present around the sequestrum. Other clinical signs include increased tearing, brown ocular discharge, and blepharospasm. The sequestrum is slowly extruded by the cornea through vascularization around and beneath the sequestrum lifting off the necrotic piece of tissue. Numerous factors have been suggested in the etiology of corneal sequestration including FHV-1 infection and chronic irritation such as entropion, non-healing corneal ulcers, trichiasis and exposure in brachycephalic cats. Feline herpes virus infection is more likely to be a factor in the etiology of corneal sequestration in domestic long and short hair cats than in Persian and Himalayan cats. Diagnosis is by the clinical appearance of a black corneal lesion in an intact cornea. It is easy to distinguish a corneal sequestrum from iris prolapse associated with corneal perforation. The iris can be seen to extend to the cornea in a perforation. Treatment options include surgical removal or medical management. If an underlying predisposing factor can be identified, such as entropion, it needs to be corrected. Medical management is aimed at preventing secondary bacterial infection and providing lubrication. A topical antibiotic ointment is used three to four times a day allowing the cornea to slough the sequestrum. This may take many months, especially in
brachycephalic cats. Surgical removal by use of a superficial keratectomy can shorten recovery time. If the sequestrum involves the deeper layers of the cornea, it may be necessary to place a conjunctival pedicle graft. Other surgical options described include placement of a free island graft and lamellar keratoplasty with use of donor tissue. Recurrences are not uncommon. Placement of a conjunctival pedicle graft has been suggested to reduce the chance of recurrence.