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## **MANAGEMENT OF CORNEAL ULCERS IN SMALL ANIMALS**

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### Corneal Ulceration

There are many causes for corneal ulceration. It is very important in practice that you not only treat the ulcer, but also examine to see if there is an underlying cause for the ulcer. Possible causes for Corneal Ulceration include eyelid disease e.g. entropion, ectropion, large eyelid openings, extra eyelashes, ectopic cilia; dry eye; exposure keratitis; foreign body; infection with Feline Herpes Virus; neurotrophic cause e.g. facial or trigeminal nerve paralysis; and trauma.

### Superficial Corneal Ulceration

#### Diagnosis of Superficial Corneal Ulceration

Fluorescein dye is water soluble and will not stain the lipophilic epithelium or Descemet's membrane. In some cases where the epithelium is totally absent the fluorescein uptake is dramatic. In some cases where the epithelium is only partially disrupted, the fluorescein may take several minutes to penetrate the semi-intact corneal epithelium. In these cases the dye uptake is initially poor and then becomes more distinct several minutes later. This may also be seen when the cornea is inflamed, e.g. in cases of keratitis.

The uptake of fluorescein stain can be highlighted by the use of a cobalt blue light e.g. a Wood's lamp. The fluorescein stain fluoresces under this light.

Magnified eye examination is required to detect extra eyelashes, small foreign bodies and other causes.

#### Management of Superficial Corneal Ulceration

Correct any predisposing cause - a complete eye examination including a Schirmer tear test is indicated in every case of corneal ulceration. Unfortunately many vets just diagnose and then treat an ulcer without even thinking why the ulcer is there.

Antibiotics are indicated in nearly all cases of corneal ulceration as the potential risk of serious complications associated with infection are enormous. Use a broad spectrum antibiotics e.g. Tricin eye ointment (Neomycin, Bacitracin, Polymyxin) for routine ulcers. Potent antibiotics e.g. gentamicin are not indicated unless there are signs of infection such as a copious ocular discharge, and or discoloration of the corneal stroma. Atropine is indicated if the pupil is small or if uveitis is present. The miosis can often be more intense with the axon reflex from superficial ulcers.

Systemic anti-inflammatory therapy is indicated when uveitis is associated with the corneal ulceration. Use NSAIDs such as carprofen in nearly all cases of corneal ulceration. Remember that if the eye is inflamed corneal healing will be delayed.

## Corneal Ulceration – Treatment

Collagen contact lenses may help protect the cornea from blepharospasm, and other sources of ocular irritation. There are two main types of contact lenses that can be used.

The traditional rigid contact lenses. My main problem with these is that they easily and often get displaced from the cornea by the action of the third eyelids and the eyelids. It is usually necessary to place a temporary tarsorrhaphy to keep the contact lens in place.

Collagen shields. These are dehydrated purified collagen that are rehydrated with either antibiotic or atropine eye drops, and then are placed onto the cornea. Again I find that a temporary tarsorrhaphy is required to keep the collagen shield in place. These collagen shields take three days to dissolve away.

Third eyelid flaps (TEF) may be required if the corneal ulcer is deep, if the eye is dry, or if it is exposed or is not healing. In most cases of superficial ulceration healing should take place within three to five days.

## Indolent Corneal Ulceration/Persistent Corneal Erosions

This group of corneal ulcerations can be extremely frustrating both to the veterinarian and to the client. Boxers, Corgis, Samoyeds, and Gold Retrievers are the most commonly affected breeds.

An indolent or slow healing corneal ulcer can be characterised by being superficial, slow healing and having loose sheets of epithelial tissue that seem to pile up and are not able to attach to the cornea. Generally superficial ulcers that take more than two weeks to heal are defined as indolent (slow healing). There are many causes for indolent ulceration. A thorough eye examination should find any underlying cause. If none can be found it could be assumed that Epithelial Basement Membrane Disease (EBMD) is the cause.

## Approach to Persistent Corneal Erosions

### Initial Debridement and Grid Keratotomy (GK)

Apply local anaesthesia, and disinfect with liberal use of 1% topical povidone iodine. Use a sterile cotton swab to debride all the loose epithelium. In some cases you will strip all of the corneal epithelium. If the dog is cooperative a grid keratotomy can be done with a nurse holding the dog. I use a 25 gauge needle and make linear incisions into the superficial corneal stroma. Do this in lines say dorso-ventral over the debrided area, then make grids by making linear incisions at 90 degrees to the first set of lines.

After the procedure a contact lens or collagen shield can be applied, but I find most dogs are comfortable after this procedure.

In our referral practice I tend to do most of our grid keratotomies under general anaesthesia. Most of these cases tend to have large ulcers that have often been treated incorrectly. For small 'local' persistent corneal erosions I will do these in the consult room under local anaesthesia. For larger erosions in a referral situation I feel more comfortable doing these under a general anaesthetic. Firstly the debridement

of the cornea can be more complete. It constantly amazes me how these erosions can be made so much larger with vigorous debridement. Under general anaesthesia the grid keratotomy can be performed with less injury to the cornea, with the advantage of a TEF can be applied under the GA.

Do not perform a GK, if the ulcer is deep, if the cornea is oedematous, if the cornea is infected or if the patient is feline! Indolent ulcers in cats are viral.

### Deeper Corneal Ulceration

For a number of reasons deeper corneal stromal ulcers can develop. These are more serious as the risk of infection, secondary uveitis and corneal perforation is increased.

Pain is not always apparent as there are fewer sensory nerves in the deeper cornea. This should be compared to superficial ulcer in which there is often considerably pain, this is because the superficial cornea has a lot more nerve endings.

### Management of Deeper Corneal Ulcers

Deep corneal ulcers are a greater risk of infection. Topical antibiotics are indicated, oral doxycycline may assist the healing of deeper ulcers, as well as reducing the risk of keratomalacia. Atropine may be needed to dilate the pupil. Systemic anti-inflammatories are indicated to control secondary uveitis.

Deeper ulcers need to slough and replace the necrotic tissue. For this reasons surgery is nearly always indicated in deeper ulcers to allow the cornea to heal quickly with the least amount of corneal scarring. Without surgery many of the deeper corneal ulcers require corneal vascularisation to fully heal. This will result in a lot more corneal scarring, so surgery is beneficial for two reasons: 1) the ulcers heal faster and 2) there will be less scarring in most cases.

### Surgery for Deep Corneal Ulceration

Surgery is indicated. Protecting the cornea will promote healing, lessen the risk of perforation, and will reduce the scarring of the cornea. The various options are Conjunctival grafting either 300/360 degree conjunctival grafts or conjunctival pedicle grafting for focal lesions, or conjunctival flap/bridge grafts, or Corneo-scleral transposition, or Corneal transplantation

### Descemetocoeles

A descemetocoele is essentially a deep ulcer that has progressed down to descemet's membrane. There can be a number of causes, but commonly infection, desiccation and inflammation are clinically the most important. This condition should be treated as an ocular emergency as the eye can easily rupture at any moment.

### Keratomalacia: The Melting Cornea - A Real Ophthalmic Emergency

A melting cornea is characterised by a rapid progression of softening, and destruction of the corneal stroma. Perforation with loss of the eye is possible within 24 hours. It is called a melting cornea because the collagenases rapidly digest (or melt) the cornea away.

The most common aetiological agent is *Pseudomonas*. This agent releases collagenases and proteases and also incites the host to release these substances. Corticosteroids may encourage corneal melting by potentiating the infection and the collagenase production and activity. Corticosteroids either topically or sub-conjunctivally or systemically are totally contraindicated in all cases of corneal ulceration.

### Management of a Melting Cornea

Withdraw any corticosteroids.

Cytology/Gram stain - *Pseudomonas* Gram negative rods

Culture - always start therapy immediately as the eye will be lost if we wait for the culture and sensitivity results.

### Antibiotics for Keratomalacia

Gentamicin: fortified - add 1 mL of injectable gentocin to the normal ophthalmic gentamicin drops. Frequent topical use, i.e. every hour.

Subconjunctival gentocin 15-25 mg can also be given.

or

Fluoroquinolone eye drops every two hours with Fusidic acid four times daily.

### Doxycycline

For melting corneas use oral doxycycline as well. Good levels of this antibiotic are achieved into the eye by oral dosage. This provides additional antibiotic cover. The doxycycline also seems to modify corneal inflammation, seems to have anti-collagenase activity and also seems to have a positive effect on corneal healing.

### Anti-inflammatory Therapy for Keratomalacia

Atropine – topically 1% eye drops tid until the pupil dilates

Atropine can also be given by subconjunctival injection at the time of surgery. Give 0.1 mg of the injectable atropine by epibulbar subconjunctival injection.

Systemic anti-inflammatory therapy is essential as most of the collagenases and the proteases are liberated by the host tissue. Decreasing an excessive host response will help to reduce the amount of collagenase being produced. Cortisone is contraindicated by all routes for a melting cornea. The cortisone greatly potentiates collagenases and even small amounts of systemic cortisone can make the keratomalacia worse. Oral NSAIDs such as carprofen should be given at the maximum dose.

### Surgery for Melting Cornea

Surgery is the main therapy to help save these corneas, conjunctival grafting provides an anticollagenolytic effect, as well as structural support and direct fibrovascular healing.

Use a thin 360 degree conjunctival graft to cover all of the cornea. I prefer not to use a pedicle graft in these cases as the cornea is soft when infected and the pedicle graft sutures can pull through.