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## DIAGNOSIS AND TREATMENT OF CORNEAL DISEASES

Corneal ulcers are a common presenting complaint in veterinary medicine and this lecture will be dedicated to the management of them. Corneal ulcers can range from a small traumatic superficial corneal ulcer that heals rapidly, to an infected deep corneal ulcer that may end up in a corneal perforation and subsequent loss of the eye.

### Common causes for a corneal ulcer include:

Trauma: traumatic corneal ulcers are often irregular in shape (depending on the type of trauma) and the animal is very painful.

Foreign body: pieces of plant material, sand, construction dust can become lodged in an eye.

### Abnormal ciliae: Distichiae, ectopic ciliae, trichiasis

Entropion can cause irritation and ulceration of the cornea. The pain resulting from the ulceration causes the animal to squint more and retract the globe. This will result in worsening of the entropion, with subsequent deterioration of the ulcer.

Lack of tear production. This is a common contributing factor to the development of a corneal ulcer or poor healing of an existing corneal ulcer.

Exposure secondary to lagophthalmos, exophthalmos or facial nerve paralysis.

Factors that are important for normal healing include a normal tear production, normal position and function of the eyelids, absence of other pathology in the cornea and young age of the animal. Factors that complicate healing include KCS, infection, presence of foreign body or abnormal ciliae, lagophthalmos, cranial nerve V problem (desensitization), cranial nerve VII problem, exophthalmos, advanced age and the presence of crystalline infiltrates.

A complete ophthalmic examination should be performed. The Tear production should be measured prior to instillation of topical anesthetic solution or fluorescein stain. The results should be interpreted in light of the clinical findings. The eyelids and eyelid margins are evaluated for position and the presence of abnormal ciliae. Samples for

bacterial culture and sensitivity should be taken directly from the ulcerated area in the cornea prior to the application of topical anesthetic. Fluorescein stain applied to the cornea will stain the corneal stroma. It will not stain intact epithelium, descemet's membrane, or the endothelium. The presence of a clear area in the cornea surrounded by a fluorescein positive ring indicates the presence of a descemetocele. A corneal perforation can be recognized by the presence of blood, fibrin and possibly iris in the center of the ulcer. Signs of an infected corneal ulcer include severe pain, pronounced miosis and corneal edema. A white infiltrate near the ulcer indicates the presence of white blood cells in the area of the ulcer. Deep corneal vessels will start to develop at the limbus after approximately 2-3 days. They extend into the cornea at a "speed" of up to 1 mm/day.

Treatment of a corneal ulcer depends on the severity. Any underlying disease needs to be addressed. Non-infected superficial corneal ulcers can be treated with topical antibiotic solution or ointment, such as triple antibiotic or gentamicin in dogs and tetracycline or erythromycin ointment in cats. I prefer ointment in dogs with an incomplete blink response/lagophthalmos/exophthalmos. Treatment is three to four times a day. Atropine can be used if a painful ciliary spasm is present. A re-evaluation is recommended in 5 – 7 days. Most uncomplicated superficial ulcers will be healed by then. If the ulcer has not improved, careful re-evaluation is needed for the presence of underlying diseases.

A mid-stromal corneal ulcer needs to be monitored more closely. The initial treatment can be similar as described for a superficial ulcer, but at a higher frequency (every 4 hours). A culture of the ulcer may be indicated. Atropine is frequently needed to keep the pupil dilated. Additional pain medications such as Tramadol may be needed. The eye needs to be re-evaluated within 24-48 hours. If improvement is noticed, the medication frequency can be decreased to 3-4 times a day with a re-evaluation in 5-7 days. If deterioration is noticed, it needs to be treated as a deep corneal ulcer. Deep corneal ulcers require aggressive medical or surgical therapy. A bacterial culture and cytology is usually indicated and an E-collar is frequently necessary. Topical ciprofloxacin or ofloxacin can be used if gram negative bacteria are present. Treatment starts initially every 1-2 hours until improvement is noticed. Atropine is used frequently

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initially to dilate the pupil. If collagenase activity appears to be present, serum is applied every 4-6 hours. Oral doxycycline at a dose of 5 mg/kg BID has a beneficial effect in melting corneal ulcers.

Surgical treatment should be considered as the therapy of choice in any rapidly progressive corneal ulcer ("melting" ulcer), descemetocoele, or corneal perforation. A deep corneal ulcer or descemetocoele is best treated by placement of a conjunctival pedicle graft. A corneal perforation can be surgically repaired using a corneal scleral transposition. It is also possible to use other sources of donor tissue to repair the corneal defect, such as a conjunctival island graft or third eyelid tissue. Biosist (porcine intestinal submucosa) is a commercially available material that provides a scaffold for tissue to grow into. Donor cornea can also be used. Graft rejection in the form of intense neovascularization is common.

Indolent ulcers are non-healing ulcers that are very superficial. Ophthalmic examination reveals a superficial corneal ulcer with redundant epithelial edges. An epithelial "lip" is often visible and fluorescein stain uptake will be present under the loose epithelium. Multiple treatment options exist for an indolent ulcer in the dog. The first step is debridement of the redundant epithelium using a (dry) sterile cotton swab. Additional procedures to expose healthy corneal stroma include a grid keratotomy, punctate keratotomy or keratotomy using a diamond burr. Aftercare consists of topical antibiotic therapy with or without atropine. Dogs may experience increased pain in the eye for a few days after these scoring procedures. Systemic carprofen or other appropriate non-steroidal analgesics or tramadol can be prescribed for a few days. Indolent ulcers that persist despite therapy are best treated by superficial keratectomy.