

Canine Corneal Ulceration: From Diagnosis to Clinical Management

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Corneal ulceration is one of the most common ophthalmic emergencies encountered in canine practice. Prompt diagnosis and appropriate management are essential to preserve vision and prevent complications such as corneal perforation and endophthalmitis. Corneal ulcers range from superficial epithelial defects to deep stromal ulcers and melting keratitis. Treatment depends on the depth, cause, severity, and presence of infection. This article reviews the etiology, clinical presentation, diagnosis, medical management, surgical interventions, and prognosis of corneal ulceration in dogs.

Keywords: Corneal ulcer, dogs, keratitis, corneal melting, fluorescein stain, ophthalmology

Introduction

The cornea is a transparent, avascular structure that provides approximately two-thirds of the eye's refractive power while serving as a protective barrier against environmental insults. Corneal ulceration occurs when there is disruption of the corneal epithelium with varying degrees of stromal involvement (Fig. 1). Due to the rich sensory innervation of the cornea by the trigeminal nerve, ulceration is typically associated with significant ocular pain. Corneal ulcers represent a common reason for veterinary consultation and require immediate intervention. Delayed treatment may lead to progressive stromal loss, corneal perforation, glaucoma, or permanent blindness.

Etiology

Corneal ulceration may result from several causes:

1. Traumatic Causes

- Scratch injuries
- Foreign bodies
- Bite wounds
- Self-inflicted trauma
- Chemical burns

2. Infectious Causes

- Bacterial infections (e.g., *Staphylococcus* spp., *Streptococcus* spp., *Pseudomonas aeruginosa*)
- Fungal infections (rare in dogs)
- Viral infections

3. Anatomical Predispositions

- Entropion
- Distichiasis

- Ectopic cilia
 - Lagophthalmos
 - Exophthalmos
- 4. Tear Film Disorders**
- Keratoconjunctivitis sicca (KCS)
 - Qualitative tear film deficiencies
- 5. Systemic Diseases**
- Diabetes mellitus
 - Endocrine disorders
 - Immune-mediated diseases
- 6. Neurogenic Causes**
- Trigeminal nerve dysfunction
 - Facial nerve paralysis
 - Neurotrophic keratitis

Classification of Corneal Ulcers

a). Superficial Ulcers

These involve only the corneal epithelium without stromal loss and usually heal within 5–7 days if the underlying cause is corrected.

b). Stromal Ulcers

These extend into the corneal stroma and are classified as:

- Mild (<25% stromal depth)
- Moderate (25–50%)
- Deep (>50%)

c). Descemetocele

A descemetocele occurs when the corneal stroma is completely lost, leaving only Descemet's membrane intact. It represents an ophthalmic emergency due to the imminent risk of perforation.

d). Melting Corneal Ulcers

These are characterized by rapid stromal degradation caused by collagenases and proteolytic enzymes produced by bacteria, inflammatory cells, and damaged corneal tissue.

e). Indolent (SCCED) Ulcers

Spontaneous chronic corneal epithelial defects (SCCEDs) are superficial ulcers that fail to heal because of poor epithelial adhesion, commonly affecting middle-aged and older dogs.

Clinical Signs

Affected dogs commonly present with:

- Blepharospasm
- Epiphora
- Photophobia
- Ocular pain
- Conjunctival hyperemia
- Corneal edema
- Corneal opacity
- Muroid or purulent discharge
- Vision impairment
- Corneal vascularization

Diagnostic Approach

History

Obtain information regarding:

- Duration of clinical signs
- History of trauma
- Previous medications



Fig. 1: Showing corneal ulceration

- Systemic illness
- Breed predisposition

Physical Examination

Complete ophthalmic examination should include:

- Menace response
- Dazzle reflex
- Pupillary light reflexes
- Schirmer tear test (performed before topical medications)
- Fluorescein staining
- Slit-lamp biomicroscopy
- Tonometry (avoid if perforation is suspected)

Fluorescein Staining

Fluorescein dye adheres to exposed corneal stroma but not intact epithelium. Positive staining confirms corneal ulceration.

Cytology and Culture

Indicated in:

- Deep ulcers
- Melting ulcers
- Non-healing ulcers
- Suspected infectious keratitis

Medical Management**Topical Antibiotics**

Broad-spectrum topical antibiotics are recommended for uncomplicated superficial ulcers.

Common choices include:

- Oxytetracycline-polymyxin B
- Chloramphenicol
- Tobramycin
- Ciprofloxacin
- Ofloxacin

Selection should ideally be based on cytology and culture in complicated ulcers.

Cycloplegics

Atropine 1% ophthalmic solution:

- Relieves ciliary muscle spasm
- Reduces pain
- Prevents posterior synechiae

It should be used cautiously because it may decrease tear production and cause prolonged mydriasis.

Lubricants

Artificial tears promote epithelial healing and improve patient comfort, particularly in dogs with tear film deficiencies.

Systemic Analgesics

Pain management may include:

- Carprofen
- Meloxicam
- Gabapentin
- Tramadol (selected cases)

Appropriate analgesia improves patient welfare and facilitates recovery.

Anti-collagenase Therapy

Melting ulcers require aggressive anti-collagenase treatment, including:

- Autologous serum
- EDTA solution
- N-acetylcysteine

These agents inhibit matrix metalloproteinases and slow stromal degradation.

Systemic Antibiotics

Systemic antibiotics are indicated for:

- Deep stromal ulcers
- Corneal perforation
- Orbital trauma
- Severe infectious keratitis

Surgical Management

Surgery is indicated when:

- Stromal loss exceeds approximately 50%
- Descemetocoele is present
- Corneal perforation occurs
- Medical therapy fails
- Progressive melting develops

Surgical Options

Third Eyelid Flap

Provides temporary corneal protection but limits visualization of the healing cornea.

Temporary Tarsorrhaphy

Protects the ocular surface while allowing periodic examination.

Conjunctival Grafts

Advantages include:

- Structural support
- Blood supply
- Delivery of immune cells
- Enhanced healing

Types include:

- Pedicle graft
- Hood graft
- Bridge graft
- 360° graft

Corneoconjunctival Transposition

Useful for deep central ulcers while preserving corneal integrity.

Corneal Transplantation

May be indicated in severe or extensive stromal defects.

Biomaterial Grafts

Modern techniques utilize:

- Porcine small intestinal submucosa
- Bovine pericardium
- Amniotic membrane
- Biosynthetic collagen matrices

These materials provide tectonic support and facilitate epithelial regeneration.

Management of Indolent Ulcers

Treatment options include:

- Grid keratotomy
- Diamond burr debridement
- Superficial keratectomy

Diamond burr debridement is generally preferred due to its favorable safety profile and high success rate.

Postoperative Care

Postoperative management includes:

- Topical antibiotics

- Cycloplegic therapy
- Lubricants
- Oral analgesics
- Elizabethan collar
- Scheduled re-examinations

Healing should be monitored using repeat fluorescein staining.

Prognosis

The prognosis depends on ulcer severity.

- Superficial ulcers generally heal within one week and have an excellent prognosis.
- Stromal ulcers usually heal successfully with prompt treatment.
- Melting ulcers and descemetocoeles carry a guarded prognosis due to the risk of perforation.
- Delayed intervention significantly increases the likelihood of vision loss.

Prevention

Preventive measures include:

- Early treatment of eyelid abnormalities
- Management of keratoconjunctivitis sicca
- Routine ophthalmic examinations in predisposed breeds
- Prevention of ocular trauma
- Prompt veterinary evaluation of painful eyes

Conclusion

Corneal ulceration in dogs is a common ophthalmic condition requiring rapid diagnosis and appropriate intervention. Management should be tailored according to ulcer depth, severity, and underlying cause. Medical therapy remains effective for uncomplicated ulcers, whereas deep, melting, or perforated ulcers often require surgical intervention. Early recognition, appropriate antimicrobial therapy, pain management, and correction of predisposing factors are essential for preserving vision and maintaining ocular integrity.

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