The Cornea: 0.5mm is all you get

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Ulcerative Keratitis
- Most ulcers are simple and heal in 24-72 hours, often DESPITE what the Veterinarian does
- When they fail to do so:
  - Did I miss the etiology?
  - Is it infected?
  - Have I done a culture/cytology?
  - What drugs are being used?
  - Is it time to discuss surgery?

Anatomy/Physiology - Cornea
- 4 Layers of the Cornea
  - Epithelium
  - Stroma
  - Descemet’s membrane
  - Endothelium

Diagnostic tests for corneal abnormalities
- Examination
- Finoff
- Biomicroscopy
- Culture
- Schirmer tear test
- Fluorescein dye
- Cytology

Cornea Epithelium
- 8-15 cell layers thick
- 7 day turnover
Diagnostic tests for corneal abnormalities

- Examination
- Finoff

Biomicroscopy

Getting Old?

You have many choices in loupes

Loupes

Bad Choice

You get what you pay for

Recommend:
- Zeiss - $$$
- Keeler
- Heine

Good Choice

Diagnostic tests for corneal abnormalities

- Examination
- Finoff
- Biomicroscopy
- Culture
Diagnostic tests for corneal abnormalities

- Examination
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- Biomicroscopy
- Culture
- Cytology

Cytology

Diagnostic tests for corneal abnormalities

- Examination
- Finoff
- Biomicroscopy
- Culture
- Schirmer tear test

www.microbrush.com
Tear Break-up

Diagnostic tests for corneal abnormalities
- Examination
- Finoff
- Biomicroscopy
- Culture
- Schirmer tear test
- Fluorescein dye
- Cytology
- Biopsy and histopathology

Ulcerative Keratitis
- Ascertain the etiology of the lesion.
- Examine the eye for:
  - eyelid abnormality

Ulcerative Keratitis
- Ascertain the etiology of the lesion.
- Examine the eye for:
  - eyelid abnormality
  - Entropion
  - Trichiasis
Ulcerative Keratitis

- Ascertain the etiology of the lesion.
- Examine the eye for:
  - eyelid abnormality
  - adherent hair
  - foreign body

Ectopic cilia

Corneal foreign body
penetrating vs perforating
Ulcerative Keratitis

- Ascertain the etiology of the lesion.
- Examine the eye for:
  - eyelid abnormality
  - adherent hair
  - foreign body
  - tear deficiency
  - BTF
  - TBUT

Ulcerative Keratitis

- Complete history
- duration
- previous therapy
  (especially corticosteroids)

Superficial Corneal Ulcer

- Generally extremely painful
- Heal within 72 hours when the cause has been removed
Superficial Corneal Ulcer
- Generally extremely painful
- Heal within 72 hours when the cause has been removed
- If the ulcer has not resolved in 3 to 5 days:
  - cause is still present
  - ulcer is infected
  - indolent ulcer is present

Indolent Ulcer
- Boxer ulcer, Recurrent erosion

Indolent Ulcer
- Hallmark features:
  - Superficial
  - Nonpainful to mildly painful
  - Loose or redundant epithelial borders
  - Usually middle aged to older dogs
  - Chronic in nature
  - Predisposed breeds - boxers
Indolent Ulcer

Debride

Grid Keratotomy

Debride

Debride

Grid Keratotomy
**Algerbrush diamond burr**

3.5mm, medium grit tip

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**Diamond Burr Debridement**

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**Indolent Ulcer**

**Treatment:**
- Client education is essential
- Remove loose, redundant epithelium
- Gently break the basement membrane with 25g needle (Grid keratotomy)
- Diamond burr
- Topical tetracycline - 50% reduced time to heal (oral doxy also works)
- Recheck every 7-14 days

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**Tetracycline and Refractory Ulcers In Vivo**

<table>
<thead>
<tr>
<th>Clinic A: Treatment with Topical Tetracycline</th>
<th>Clinic B: Treatment with Topical Tobramycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Graph A] Healed by 14 days</td>
<td>![Graph B] Healed by 14 days</td>
</tr>
<tr>
<td>![Graph A] &gt;30 Days Healing/ Surgery</td>
<td>![Graph B] &gt;30 Days Healing/ Surgery</td>
</tr>
</tbody>
</table>

Chandler H, Colitz CMH 2005
**Indolent Ulcer**

- **Treatment:**
  - Contact lens: 15mm diameter, thin, soft bandage lens
  - Base curve Acrivet
  - Antibiotics

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**Placing the Acrivet® Contact Lens**

- **Product Information:**
  - **Name:** Acrivet
  - **Address:** 9067 South 1300 West, Salt Lake City, UT 84121 USA

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**Indolent ulcer – 3 month duration**

- Not treated correctly now heals by granulation

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**Adult cat - herpes**

- Classic dendritic ulcer
- No URT signs

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**Effect of corneal contact lens wear on healing time and comfort post-ECR for treatment of SCCEDs in horses**

- **Authors:**
  - Tricomi J., Wold and Joanne C. Norman

- **Abstract:**
  - The primary aim was to determine whether dogs with spontaneous chronic corneal ulcers that are treated with an improved contact lens system described above would heal faster than those treated with soft bandage lenses alone.

- **Conclusion:**
  - The contact lens system described above was shown to be effective in treating corneal ulcers in horses and significantly reduced the time to healing compared to soft bandage lenses alone.
**Herpes**

- Diagnosis:
  - dendritic or punctate superficial corneal ulcers
  - pathognomonic for herpes keratitis

**Herpes felis**

- 70% of cats infected with herpes virus will become carriers
- recurrent conjunctivitis/keratitis
- stress and immunosuppression will predispose to recurrence
  - FeLV
  - FIV
  - Other

**Treatment:**
- Antiviral agents topically
  - Idoxuridine - Stoxil, Herplex
  - Trifluorothymidine - Viroptic
  - q2-4 hr
- Cidofovir 0.5%
  - q12 hr

**Herpes felis**

- **Diagnosis:**
  - History - previous stress?

**Treatment**
- Antivirals - Systemic
  - Famciclovir
    - Variable doses listed
    - 55 mg/cat divided daily
    - New data suggests 40 mg/kg PO
    - 90 mg/kg PO TID
Herpes felis

- **Treatment:**
  - L-lysine, 250-500 mg/day PO

Interferon

- 30 units PO 7 days on/7 days off and repeat
- 3,000 - 6,000 units/ml topically

Intranasal vaccine

Midstromal Corneal Ulcer

- Managed medically
- Associated anterior uveitis
- Cytology
- Culture/Sensitivity

Treatment:

- **Topical antibiotics**
  - Broad spectrum, every 2-6 hours
  - Neomycin-bacitracin-polymyxin
  - Gentamicin - poor choice
  - Ciprofloxacin
  - Levofloxacin
  - Gatifloxacin
**Midstromal Corneal Ulcer**
- Treatment:
  - 1% Atropine
  - as needed to dilate the pupil, but not more than 4x/day

**NO Corticosteroids Topically!!!**

**Midstromal Corneal Ulcer**
- Treatment:
  - Surgery if progressive
  - Desmetocele
  - Melting/collagenase ulcer
  - Acute eruptive keratopathy (feline)

**Deep/Desmetocele Corneal Ulcer**
- Fluorescein negative centrally

**Melting Corneal Ulcer**
- Enzymatic breakdown of the cornea
Melting Corneal Ulcer
- Surgery often indicated
- Debridement of the melting portion

**Treatment:**
- As for deep ulcers, but more aggressive
- Antibiotics are administered every 1-2 hours
  - Ofloxacin
  - Levofloxacin
  - Gatifloxacin
- Anticollagenase
- Serum
- Tetracycline - topical, systemic
- + Surgery

Acute Eruptive Keratopathy
- Possible association with systemic immunosuppression

Acute Bullous Keratopathy
- Retrospective MSU/Ohio State
- 14 cats from 2000-2008
- 12/14 with systemic disease
- 10/14 on systemic immunosuppressive therapy
  - 9/10 - prednisolone (1-2 mg/kg q 12-24h)
  - 8/10 on concurrent cyclosporine (1.6-7 mg/kg q 12-24h)
- 10/28 eyes developed ABK
- 13/19 eyes remain sighted

*Pierce KE, Bartoe JT, Wilkie DA et al: AN ASSOCIATION BETWEEN ACUTE BULLOUS KERATOPATHY AND ADMINISTRATION OF SYSTEMIC ANTI-INFLAMMATORY/IMMUNOSUPPRESSIVE THERAPY IN CATS. ACVO 2010*
Acute Eruptive Keratopathy

Treatment with conjunctival graft or 3rd eyelid flap

Acute Eruptive Bullous Keratopathy

Corneal Surgery
- General anesthesia
- Non-depolarizing neuromuscular blocking
- Head positioning is essential

Microsurgery
- Patient position critical
- No movement under anesthesia
- Sand bags
- Vacuum pillows
- Paralysis

Fundamentals of Microsurgery
- Prior to surgery
  - Position the patient
  - Lateral vs dorsal recumbency
  - Sand bags, vacuum pillows
  - Eye looks up into microscope

Pre-Operative Prep
- Clip hair
- 0.5% povidone iodine (1:20 to 1:50 dilution)
- Final prep - povidone iodine 10%
- Avoid chlorhexidine
Specialized instruments

Zeiss Operating Microscope

Zeiss 4x Loupes

Human Hair

9-0 Monofilament Vicryl

Corneal Surgery

- Exposure
- Do you need a lateral canthotomy?

Superficial Keratectomy

- Thickness of the normal canine cornea is 0.4-0.7mm
- #64 Beaver blade/Desmarres corneal dissector

Patient
Stay suture
Include the epithelium
Superficial Keratectomy

Feline Sequestrum Keratectomy

https://www.youtube.com/watch?v=JjHx6-TR&d0
Sequestrum

May spontaneously slough

Conjunctival autografts

- Advancement, hood, bridge, pedicle, and complete conjunctival graft
- Bulbar vs palpebral conjunctiva
- Indications:
  - deep non-perforating corneal ulcers that have failed to respond to medical therapy
  - descemetoceles
  - mycotic keratitis
  - bullous keratopathy
  - recurrent erosions
  - stromal abscessation
  - keratolymphia
Equine conjunctival pedicle graft - trimming

Equine conjunctival pedicle graft - trimming

Canine conjunctival pedicle graft - trimming

Graft Failure
Ischemic necrosis, will usually re-vascularize and succeed

Corneal Perforation
Feline corneo-conjunctival graft

1 yr post-op

Canine corneo-conjunctival graft

24 hr post-op

http://youtu.be/NwznZhGrK6M

http://youtu.be/JjHx6-TRkI0
Canine Limbal Melanocytoma

Use of commercial collagen to repair:
- Acell®
- BioSIS®

Limbal melanoma – excision plus BioSIS®

Limbal melanoma – excision plus diode laser
Corneal endothelial dystrophy

Treatment
- hypomotomics
- conj. graft
- fresh transplant

Endothelial Dystrophy Keratoepithesis

http://youtu.be/qX4kSgXu3gw
Pigmentary Keratitis

- Common in Pug, KCS
- chronic keratitis
- Treatment
- Keratectomy
- Recurrence or Cryosurgery?

Corneal Trauma

- Perforation / Laceration
- Sharp Corneal Trauma
- Blunt Corneal Trauma

Adjuvant cryotherapy for pigmentary keratitis in dogs: a study of 16 corneas

Thierry Aubry
Department of Animal Welfare, F. Chastang & Associates, K2P Hospital, France
Cat Claw
Non Perforating

Cat Claw
Perforating

Cat Claw
Perforating with Iris prolapse

Seidel Test
Positive Seidel Test - Canine

Magnification
Epinephrine
Viscoelastic
8-0 to 9-0 suture
Microsurgical instruments

http://youtu.be/ex8EZVnP2aI

Pre-op

1yr post-op
Cat Claw
Perforating with
Lens capsule tear

Cat Claw
Perforating with
Iris prolapse
Phacoanaphylaxis

Blunt trauma

Blunt vs Sharp

So what do you think?
Prognosis?