PACK-CXL in veterinary medicine: applications and experiences

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**Keratomalacia - melting keratitis**

- Collagenase enzyme activity
- Typically bacterial infections in companion animals
- Fight structural degradation:
  - Medical Tx
  - Surgical Tx
- In some cases **no timely control** of stromal degradation.
The many faces of globe perforation
Veterinary Ophthalmology

Medical Tx melting keratitis

- E-collar
- Broad spectrum antibiotics every 1-2 hours (Neomycin/Polymyxin/Gramicidin, Ofloxacin)
- Collagenase-inhibitors (6-12 times daily):
  - Autologous serum
  - EDTA
- Atropine to effect
- Systemic non-steroidal anti-inflammatories
- Systemic antibiotics (Globe perforation)
Surgical therapy complicated ulcer
But what to do with this patient?

- Partially deflated globe!!
- How large a tectonic graft necessary?
- What type of graft?
And this one?
Melting ulcer therapy
Antibiotic resistance

- 'Retrospective analysis of corneal microbial culture and cytology results from dogs, cats and horses in Switzerland', Masters thesis Anja Suter cand med vet, Vetsuisse Faculty, Equine Clinic, University of Zürich. (November 2013-present)
• Healthy and diseased equine eyes sampled


Equine Keratomycosis in Switzerland

- Healthy and diseased equine eyes sampled
- Aspergillus fumigatus
- No Fusarium spp.
- Hospitalization ≈ 15 days, Total Tx time ≈ 6 weeks
- 64% of globes saved


PACK-CXL: current clinical set-up Zürich

- General inhalation anesthesia
- Standard Dresden keratoconus protocol
- No fluorescein staining prior to PACK-CXL
**PACK-CXL in dogs and cats: compilation**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Dogs</th>
<th>Cats</th>
</tr>
</thead>
<tbody>
<tr>
<td># eyes (5 studies, unpublished data)</td>
<td>68</td>
<td>32</td>
<td>36</td>
</tr>
<tr>
<td>Brachycephalic/total</td>
<td></td>
<td>18/32</td>
<td>13/35</td>
</tr>
<tr>
<td>Treatment failure</td>
<td>8/68 (12%)</td>
<td>7/32</td>
<td>1/36</td>
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- Ulcer depth (%): 50% (15-80)
- Ulcer size variable
- Treatment → stabilization: < 14 days
- Treatment → defect closure: 14<->30 days
- Culture positive: 16/66 (Staph, Pseudomonas, Strep)

PACK-CXL in dogs and cats: controlled study

- Non-inferiority PACK-CXL
- Stabilization of all corneas receiving PACK-CXL rescue treatment
- No CXL-related complications observed

PACK-CXL in cats: examples
PACK-CXL in dogs: examples
PACK-CXL: when to treat?

**Infiltrate / early ulcer?**

Pack-CXL: prospective, randomised multicenter trial 2015 – xxxx

Pack-CXL Study Group (Prospective, randomised multicenter trial, 16 sites)

**Advanced ulcer?**


Slide contributions F Hafezi, MD PhD
Two studies from Sweden (21 eyes, standard protocol):

Treatment effect of stand-alone PACK-CXL inconsistent

CXL: interspecies variations

Red: Actin

CXL: interspecies variations

CXL: interspecies variations

CXL: Bullous Keratopathy

- Treatment of painful recurrent erosions
- Goals:
  - Resolution of ulceration and pain
  - Rehabilitation of vision

Veterinary Ophthalmology

PACK-CXL: protocol optimization

- Species adapted protocols
- Indication adapted protocols
- Shortening of treatment time: 2.5 vs 30 minutes
- Antimicrobial effects
  - Fungal isolates
  - Bacterial isolates

Schrier et al., IOVS, 2008; Martins et al., IOVS, 2008

Projects in progress:

- "Retrospective analysis of corneal microbial culture and cytology results from dogs, cats and horses in Switzerland", Masters thesis Anja Suter cand med vet, Vetsuisse Faculty, Equine Clinic, University of Zürich. (November 2013-present)
- "In vitro bactericidal effect of PACK-CXL on bacterial isolates from melting corneal ulcers in dogs", Dissertation Anja Suter cand med vet, Vetsuisse Faculty, Equine Clinic, University of Zürich. (April 2014 - present)
- "In vitro fungicidal effect of PACK-CXL on equine keratomycosis isolates", Dissertation Lena Meile cand med vet, Vetsuisse Faculty, Equine Clinic, University of Zürich. (May 2014-present).
Questions ??????