The uvea

Zita Makra DVM
Equine Department and Clinic
Veterinary Faculty, SZIU

Makra.Zita@aotk.szie.hu
Terminology

• *Uvea*= vascular layer (tunica vasculosa)

ANTERIOR UVEA: Iris & ciliary body
POSTERIOR UVEA: Choroid

• Immunologically active (Ly-s can form lymphoid follicles)
Posterior chamber
Anterior Chamber
Cornea
Iris
Ciliary body
Lens
Vitreous Fluid
Macula
Optic disk
Retina
Choroid
Sclera
Optic nerve

Iris

- Separates the anterior and posterior chambers
- Regulates the amount of light (pupil)
- Layers: - anterior epithel
  - stroma (muscles, vessels, pigment-cells)
  - posterior pigment epithel
    (pars iridica retinae)
Iris

- Iris surface has many folds and furrows
- Most irises are brown
- Others are blue, gold, white
- Heterochromia
  - husky, paint horse, appaloosa, pinto
- Granula iridica (Eq, Ru)
Heterochromia
Iris musculature

*Iris dilator muscle*
- sympathetic innervation
- better developed in vertical meridians

*Iris sphincter muscle*
- parasympathetic innervation
- circumferentially near pupil

Ciliary body

- ≈ triangular outline
- Ciliary muscle (parasympathetic innervation)
- Pars plicata:
  - ciliary body processes produce aqueous humor
  - lens zonules hold the lens in place (+accomodation)
- Pars plana:
  - joins the retina: ora ciliaris retinae
Ciliary body

Choroid

- Between the retina and sclera, rich in vessels
- Histologically has 4 layers
- Supplies the outer layer of the retina (eq: whole retina)
- At the dorsal fundus, between the retina and chorioid tapetum (reflective layer, except the pig), stars of Winslow
Aqueous humor

Irido-corneal outflow conventional

Uveo-scleral outflow horse


Gilger, 2005.
Abnormal aqueous humor

Breakdown of the blood-aqueous barrier

- Aqueous flare: increased protein in AC
- Fibrin in AC
- Hypopyon = white blood cells in AC
- Hyphema = blood in AC

These changes of the aqueous humor are usually associated with anterior UVEITIS!
Hyphema

Blood in AC
Possible causes:
- trauma
- anterior uveitis
- bleeding disorder (thrombocytopenia)
- intraocular neoplasia

Potentially life-threatening condition!
Consider ocular ultrasonography!
Rule #1.

With unilateral or bilateral breakdown of the blood-aqueous barrier consider possible underlying systemic disease,

unless there is an obvious explanation such as corneal disease or ocular trauma!
Keratic precipitates (KPs)

- Accumulation of inflammatory cells on the inner surface of cornea
- Indication of ANTERIOR UVEITIS
Congenital disorders

- Persistent pupillary membrane
  - remnants of the anterior tunica vasculosa lentis
  - usually regress over first 6-12 months of life

PPM

With corneal adhesion
Congenital disorders

- Iris coloboma/iris hypoplasia
  - congen. abscence of tissue, color dilute breeds
  - inferior position (6 o’clock) is typical, often with other ocular abnormalities
Congenital disorders

- Iris cysts
  - usually attached to granula iridica: transilluminated ↔ tumor (ultrasound)
  - may be free floating
  - cause no problems (burst with laser)
Congenital disorders

- Anterior segment dysgenesis/aniridia (rocky mountain horses)
- Policoria, acoria, excentric pupil
Uveitis, terminology

- **Anterior uveitis** = iridocyclitis
  (inflammation of the iris and ciliary body)

- **Posterior uveitis** = chorioiditis
  (inflammation of the chorioid, retina often affected as well = chorioretinitis)

- **Panuveitis** = anterior + posterior uveitis
<table>
<thead>
<tr>
<th>Uveitis Causes</th>
<th>Type</th>
<th>Existence</th>
</tr>
</thead>
<tbody>
<tr>
<td>idiopathic</td>
<td>fibrinous</td>
<td>acute</td>
</tr>
<tr>
<td>autoimmun</td>
<td>suppurative</td>
<td>chronic</td>
</tr>
<tr>
<td>with infect. syst. disease</td>
<td>haemorrhagic</td>
<td>recurrent</td>
</tr>
<tr>
<td>with noninfect. syst. disease</td>
<td>granulomatous</td>
<td></td>
</tr>
<tr>
<td>trauma</td>
<td></td>
<td></td>
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<tr>
<td>2. reflex uveitis(corneal ulcer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>toxic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lens induced</td>
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<tr>
<td>uveodermatological (immun.med.)</td>
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<tr>
<td>ERU</td>
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</table>
Uveitis – Clinical findings

Acute:
• blepharospasm, epiphora, photophobia
• conjunctival hyperemia
• aqueous flare
• inflammatory deposits: hypopion, keratic prec.
• iridal petechia, hyphema
• miosis
• decreased intraocular pressure (IOP↓)
• corneal edema, ciliary injection
• swollen, dark infiltrated iris
• hyalitis, chorioiditis
Acute uveitis
Uveitis – Clinical findings II.

Acute → chronic/complications:

- Corneal endothelial degeneration/dystrophy
- Corneal vascularization/precipitates
- Lens luxation/subluxation
- Vitreal opacities (hyalitis)
- Focal chorioretinitis, retinal detachment
Uveitis – Clinical findings III.

Chronic:
- organised exsudates in the AC
- posterior synechia
- fibropupillary membrane, dyscoria
- occlusion of pupil, iris bombe
- keratic precipitates
- iris hyperpigmentation/neovascularization
- catract
- glaucoma
- endstage: phthisis bulbi
Chronic uveitis
Cat uveitis+cataract

Uveitis-FIP

Uveitis+iris bombae
Iris bombe
Phthisis bulbi
Rule # 2.

If the IOP is normal or ↑ in an eye with clinical signs of anterior uveitis, you have to suspect the presence of glaucoma!
Rule # 3.

Every red eye (with or without uveitis) needs to be stained with FLUORESCEIN!
Treatment of uveitis (1.)

Aims:

• Elimination of the cause, if possible (treat syst. disease)
• Preserve vision
• Control discomfort and active inflammation
• Minimize permanent changes
• Client education:
  -clinical signs to look for
  -re-initiation of treatment
TREATMENT OF UVEITIS. I.

LOOK FOR SYSTEMIC CAUSE:
- History
- Systemic examination
- Bloodwork
- Urinalysis, imaging...
- Aqueous paracentesis
Treatment of uveitis (2.)

- Topical antiinflammatories:
  - Corticosteroids 1-6x daily, depending on severity
  - Make sure that cornea is fluorescein negative!
  - Prednisolone acetate 1%
  - Dexamethasone 0.1%
  - Triamcinolone

In subconjunctival injection!
Rule # 4.

- It is contraindicated to apply topical **corticosteroids** in an eye with corneal ulcer!
Injured cell - \textbf{cell membrane phospholipid} + mediators of mast cells

\textbf{Phospholipase A}_2 enzime

\textbf{Corticosteroids}

\textbf{Cyclooxygenase inhibitors}  
(flunixin, phenilbutazone, ketoprofen, aspirin)

\textbf{Arachidonic acid}

\textbf{Cyclooxygenase inhibitors}  
(flunixin, phenilbutazone, ketoprofen, aspirin)

\textbf{Lipoxygenase inhibitors}  
(ketoprofen)

\textbf{Prosztanoids}  
- \textbf{Prosztaglandins} (miosis, IOP↓)  
- \textbf{Prosztacyclin} (blood-aqueous barrier breakdown)

\textbf{Leukotrienes}  
(cellular infiltration of uvea, miosis)
Treatment of uveitis (3.)

• Topical antiinflammatories
  - non-steroidal 1-6x daily
  - can be used with fluorescein stain uptake, but be careful!
  - Diclofenac 0,1%
  - Flurbiprofen 0,3%

• Systemic anti-inflammatories
  - non-steroidal (NSAIDs):
    - flunixin meglumine 1,1mg/kg 2x daily
    - phenylbutazone 1-4 g/horse/day
    - aspirin/ketoprofen po.
    - Monitor for GI ulcers!
Treatment of uveitis (4.)

- **Mydritics and cycloplegics**
  - Atropin 1-2% (dilate pupil)
  - In severe cases up to q 4hours,
    in mild cases 1x daily
  - Potential complication: Colic
  - Monitor gut motility!
Effects of atropine

• Mydriatic=dilates pupil
  -minimize adhesions (synechiae)
  -may not be able to break down synechiae in chronic cases

• Cycloplegic=relaxes ciliary muscle
  -relieve ciliary muscle spasm
  -pain relief

• Stabilizes blood-aqueous barrier
Rule # 5.

- The effectiveness of atropine to keep the pupil dilated gives us information about the severity of uveitis.

- The longer and better the pupil stays dilated, the milder the uveitis.
Rule # 5.

- In a normal eye, one dose of atropine can keep the pupil dilated for up to 1-4 weeks (only for therapeutic purpose).
- Eyes with a brown iris stay longer dilated than eyes with blue iris.
As the clinical signs improve, the frequency of drug application can slowly be decreased.

If the clinical signs worsen as the medication is decreased, then the dosing should be temporarily increased again.
Treatment of uveitis (6.)

Alternative methods: acupuncture
Eye hood+box rest
Endophthalmitis

• Severe uveitis with involvement of aqueous humor and vitreous, but not sclera
• Panophthalmitis: severe inflammation that also involves the sclera & orbital tissues
• Clinical signs: see uveitis, but more severe
• Treatment: see uveitis, +**systemic antibiotics**
Endophthalmitis (2.)

• Consider culturing aqueous humor and vitreous aspirate!

• Intravitreal injections (last chance before enucleation)
  - 200 µg gentamicin: Gr –
  - 2,2 µg cefazolin: Gr +
  - 0,1 mg miconazole/fluconazole: fungal

  - Should be done by specialist!
Trauma I.

- Penetrating/blunt
- Check for periorbital skull fractures
- Penetrating trauma: see corneal perforation
  - iris prolapse

- Careful clinical examination
- Consider ultrasonography if hyphema prevents examination
- Clinical signs: see uveitis (hyphema, miosis)
Trauma II.

- Prognosis is guarded with intraocular hemorrhage
- Treatment:
  - symptomatic treatment of uveitis
  - topical mydriatics
  - systemic and topical anti-inflammatories
  - surgery for penetrating injury
Traumatic uveitis
poor prognosis
consider enucleation
Other diseases of the anterior uvea
Iris neoplasia

• Rare
• **Melanoma** most common, esp. grey horses

• Clinical signs:
  - Dark mass in AC
  - Distorsion of pupil

• Treatment:
  - enucleation or sector iridectomy

• Other rare tumors: medulloepithelioma, multicentric lymphoma
Iris atrophy

• Thinning of the iris (also with age)
• Older horses, esp. with heterochromia iridis
• Atrophy of granula iridica with chronic uveitis or glaucoma
Thank you for your attention!