High resolution ultrasound in equine ophthalmology to display the anterior segment of the eye

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High resolution ultrasound

- Difference HRUS ⇔ normal ultrasound
- Indications for ophthalmic ultrasound
- Method
- Normal anterior segment anatomy
- Some case examples
HRUS high resolution ultrasound

- HRUS = high resolution ultrasound
- Frequency above 10 MHz
- Advantage: the higher the frequency, the better the resolution
- Disadvantage: the higher the frequency, the poorer the tissue penetration
- High resolution in near field
- No offset device required
- Penetration of max. 40 mm at 12 MHz
- High lateral (0.38 mm) and axial (0.21 mm) resolution
Indications for ophthalmic ultrasound

- Opacities of the ocular media (corneal opacities, hypopyon, hyphema, cataract, cloudy vitreous)
- Differentiate between e.g. iridal cysts ⇔ melanoma
- Glaucoma: determine diameter of globe, corneal thickness
Method

- Requires no sedation
- Dark room
- Ultrasound contact gel
- No clipping required
- Comparable quality of both transpalpebral and direct coupling images
- No offset device
Ultrasound and probe

- Siemens SONOLINE® Omnia
- Linear Array VF 13 – 5
Normal anterior segment anatomy

- C = cornea
- AC = anterior chamber
- I = iris
- PC = posterior chamber
- L = lens
Normal anterior segment anatomy

- C = cornea
- NB = nigroid bodies
- AC = anterior chamber
- I = iris
- L = lens
Ulcer

- Corneal appearance after placement of conjunctival flap
- Further ocular irritation
- HRUS- examination to determine eventual internal ocular structure damage
Anterior synechiae

- C: cornea
- I: iris
- AC: anterior chamber
- Anterior synechiae
  persistent irritation ⇒ synechiolysis
After synechiolysis

- C: cornea
- AC: anterior chamber
- I: iris
- L: lens
- No communication between iris and cornea
Hyphema

- Post traumatic tear in the sclera
- C: cornea
- AC: anterior chamber
- L: lens
Posterior synechia (Iris Bombé)

- C: cornea
- I: iris
- AC: anterior chamber
- ALS: anterior lens surface
- L: lens
Iris cyst

- C: cornea
- CY: cyst
- AC: anterior chamber
- L: lens
- Cyst: anechogenic
- Melanoma: echogenic
Glaucoma

- Glaucoma = Increase in intraocular pressure
- Normal range: 16-25 mm Hg
- Lead to corneal edema
- Lens luxation?
Luxatio lentis anterior

- Luxated lens in iridocorneal angle \( \Rightarrow \) reduction in aqueous outflow \( \Rightarrow \) Increase in intraocular pressure

- C: cornea
- L: lens
- AC: anterior chamber
- VB: vitreous body
After phacoemulsification

- C: cornea
- AC: anterior chamber
- I: iris
- VB: vitreous body
Absolute glaucoma

- Distinct corneal edema
- Buphthalmos
Zonules

- C: cornea
- AC: anterior chamber
- I: iris
- Z: zonules
- L: lens
Conclusion

• Ultrasonic examination is a simple and efficient means of evaluating eyes with opaque optic media

• Improved presentation of individual ocular structures when compared to conventional ultrasound, especially those located within the anterior segment