V429
The Equine Ocular Examination

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OVERVIEW OF THE ISSUE

- Provide an overview to the basic instrumentation, supplies and diagnostic pharmaceuticals required for a complete ophthalmic exam in the equine patient.
- Discuss the key components of the "minimum ophthalmic data base".
- Provide helpful tips to ensure success in performing the complete ophthalmology exam for horses.

OBJECTIVES OF THE PRESENTATION

- Equine ophthalmic examinations should include the following: a good history and signalment, examining the patient in a well-lighted as well as darkened environment.
- The environment should be quiet and away from major distractions.
- Typically, equine patients require systemic sedation and local nerve blocks to ensure that a thorough ocular exam is acquired.
- Always strive to acquire the "minimum ophthalmic data base" to best diagnose and treat your equine ophthalmic patients. **Rarely**, an aspect of the complete ophthalmic exam will be forfeited (example: tonometry should not be performed on an eye with a descemetocele due to risk of globe rupture).
- Components of the **minimum ophthalmic data** base include: menace response, direct and consensual pupillary light reflex, palpebral reflex, Schirmer tear test, fluorescein stain, and tonometry. This lecture will discuss what components of the minimal ophthalmic data base are sometimes not performed in horses and why.
- Note that the menace response, PLR, and palpebral reflex should be performed prior to the administration of any systemic sedation.
- Additional diagnostics typically performed in an awake patient include: conjunctival / corneal cytology and/or culture and sensitivity, conjunctival biopsy, and nasolacrimal flush.

KEY POINTS

Basic Instrumentation

A thorough ophthalmic examination may be performed with a minimum of diagnostic instrumentation. Basic instruments include:

- Magnifying source—(e.g., Optivisor loupe)
- Power source—(e.g., Welch-Allyn (W-A) 3.5V halogen handle)
- Focused light source—(e.g., Welch-Allyn Finoff transilluminator)
- Direct ophthalmoscope head—attaches to W-A 3.5V handle
- 20–15 diopter condensing lens
- Tonometer (e.g., Tonopen)
- Nasolacrimal cannula
- Thumb forceps
- Scraping blade—spatula or surgical blade (clip-on end)

Supplies & Diagnostic Pharmaceuticals

Consumable materials that should be readily available are:

- Schirmer tear test (STT) strips
- Sterile fluorescein strips
- Culturette swabs (mini-tip)
- Cotton swabs
- Sterile eye wash irrigating fluid or sterile saline

- Dilating agent—1% tropicamide (Mydriacyl)
- Topical anesthetic solution—0.5% proparacaine (Alcaine or Ophthetic)

Use of a Transilluminator

The transilluminator powered by a 3.5V handle is used to closely inspect extraocular structures including the lacrimal caruncle, the nasolacrimal puncta, the leading edge of the third eyelids, the tarsal (meibomian) glands, and the limbus of each eye. Conjunctival vessels are differentiated from episcleral (ciliary) vessels. Translucency of the cornea is determined.

Intraocular structures in the anterior segment of the eye may also be examined. The light is directed obliquely across the anterior portion of the globe and the depth and clarity of the anterior chamber is noted. The color and surface contour of the iris and the size and symmetry of the pupillary openings are observed. Direct and consensual pupillary responses are tested. Recall that the use of dilating agents will invalidate pupillary responses for several hours.

Direct the light through the pupils and observe the fundic reflexes. The presence and color of tapetum will determine the color of the fundus reflex. The lenses are normally translucent and allow reflected light to fill the pupil spaces. In most horses the tapetal reflection is gold to green and sometimes red. Opacities are frequently detectable by this technique which is referred to as retroillumination. A partial or complete absence of a fundus reflex indicates opacification involving one or more portions of the normally transparent parts of the eye.

Schirmer Tear Test

The Schirmer tear test (STT) is a method of measuring basal and reflex tear production in horses when deficient tear volume (aqueous component) is suspected. It is performed by inserting a sterile filter paper strip into the lower, middle conjunctival fornix of each eye. The strip is inserted and left in place for 60 seconds, then removed and the length of the filter paper that has been moistened by the tear fluid is measured on a mm scale. Deficiencies in aqueous tear production have rarely been reported in the horse. Therefore, STT is not commonly performed as part of the routine minimal ophthalmic data base in this species. Nevertheless, a STT would be indicated if evidence of cranial nerve dysfunction were present (after trauma, facial paralysis), if the corneal or conjunctiva appear dry, if muco-purulent discharge is present, when corneal vascularization or ulceration if evident, or if an underlying problem for a corneal or conjunctival problem cannot be determined. Normal values for horses have been reported and a wide variability between eyes and between the same eye during different times of the day have been published. This variability seems to be unrelated to signalment, housing, or season. In general, the equine STT values are much greater than those reported for either the canine or feline species. Healthy horses have been reported to have be between 15 and 20 mm. 30 seconds. In general, repeatable measurements of less than 10 mm wetting/min should be considered abnormal in conjunction with clinical signs.

Conjunctival-Corneal Cultures & Scrapings

Cultures of the ocular surface are necessary for definitive diagnosis of severe, chronic, or nonresponsive infections. For conjunctival culture, the lower eyelid is everted and a sterile cotton or rayon-tipped swab in applied to the ventral fornix in front of the third eyelid. To insure adequate tissue contact the swab tip is gently pressed against the conjunctiva and rotated so as to slightly elevate the conjunctival tissue. The swab is then removed and inserted into the transport tube which contains an ampule of transport media. The ampule is ruptured and the sample is sent to the laboratory as soon as possible. Some specimens may be refrigerated depending upon the type of culture, i.e., the organism suspected. For corneal cultures, the swab is applied to the margin of the ulcerated or necrotic lesion. Ideally, cultures should be taken prior to instillation of topical agents, including topical anesthetic. However, in cases of corneal ulcers, one drop of topical anesthesia will aid patient compliance and has been shown to have minimal effects on culture results. Contamination is avoided by being cautious not to touch the skin or hair with the swab tip.

Cytologic evaluation of ocular surface cells may be quite helpful in making a definitive diagnosis in cases of inflammatory or neoplastic lesions. For cytology, spatula collection is preferred over swabs for removal of surface cells at affected sites. Samples for conjunctival or corneal cytology are collected after discharges are cleansed from the eye and topical anesthetic has been instilled. Several drops of topical anesthetic solution are instilled over a 2-minute period (e.g., 1 drop every 30 seconds). Platinum spatulas

are specifically designed for ocular use, however, less expensive spatulas, such as pharmaceutical or chemical spatulas or the blunt, snap-on end of a surgical blade, may also be used.

Scrapings are collected by placing the spatula or blade (blunt end) perpendicular to the surface, by pressing firmly against the tissue, and then pulling along the surface. Samples collected from scrapings should be gently blotted onto glass slides and air dried. A minimum of three slides should be prepared, one for a modified Wright's stain, one for a Gram's stain, and the remaining one for special staining if needed. Cytologic findings of greatest diagnostic interest are the presence of inflammatory or neoplastic cells or the presence of microorganisms.

Fluorescein Staining

Fluorescein dye is used diagnostically in veterinary ophthalmology for a number of reasons. The most common and important reason for placing fluorescein stain onto the eye is to detect a corneal ulcer. Recall that the corneal stroma is hydrophilic and, therefore, the water soluble fluorescein has a marked affinity for exposed stromal tissue. An area of positive staining will be noted by a bright yellow-gold appearance under room light conditions or using a focal white light. A cobalt blue filter on the tip of a hand-held transilluminator or an ultraviolet (UV) light will excite the fluorescein and any area of positive staining will appear bright green. Keep in mind that fluorescein does not stain epithelial surfaces or Descemet's membrane. Fluorescein may also be used to determine patency of the nasolacrimal (NL) drainage ducts (Jones test).

The most common way to apply Fluorescein stain to the equine eye is to place a sterile fluorescein strip in a 3-ml syringe, fill the syringe with sterile eyewash and replace the plunger, and then squirt the solution through the hub of a 25-guage needle in which the actual needle has been manually broken off. Care should be taken to properly dispose of the needle tip. The horse is then allowed to blink several times and excess stain can be removed with gentle irrigation. The eye is scanned with a focused light (typically with a cobalt filter or UV light). A short time later, usually in 5 minutes, the nares are inspected using the focused light to determine if fluorescein has passed through the nasolacrimal ducts. If dye has not drained into the nostrils by 20 to 30 minutes after instillation, obstruction of the duct is may be suspected and NL irrigation may be indicated. Sometimes, a negative Jones test may even be normal in the horse due to the large volume capacity of the nasolacrimal duct. As with all diagnostic tests, their findings should be interpreted in light of the horse's clinical signs.

Nasolacrimal Irrigation

Nasolacrimal flushing can be performed retrograde (i.e., from the distal nares' opening)or normograde (i.e., from the upper or lower eyelid puncta). Sedation is usually required. The nasal puncta can be cannulated using a 4 to 6 Fr canine urinary catheter coated in lidocaine gel. Digital pressure is usually needed to prevent normograde loss of fluid. A 10 to 20 ml syringe, filled with eyewash, is attached and gentle irrigation of the nasolacrimal duct is performed until fluid exits the upper puncta near the medial canthus. Be aware that violent sneezing often ensues when performing retrograde NL flushing. Normograde flushing can be attempted using a lacrimal canula or 20-guage IV catheter once the stylet has been removed. If resistance is encountered to attempts at irrigation, an obstruction is probably present. Continued gentle pressure may flush out minor obstructions. Excessive pressure should be avoided so that the duct system is not further damaged.

Ophthalmoscopy

Either direct or indirect ophthalmoscopy may be used to examine the posterior portion of the eye, i.e., the vitreous and fundus. The monocular direct ophthalmoscope is commonly used in general practice for examining the back of the eye. There are two dials on the direct ophthalmoscope head—a smaller horizontal dial that controls the size and shape of the light beam and a larger vertical dial that controls the focal point of the light beam. The horizontal dial is set to project a large circular white light beam and the vertical dial is adjusted to focus on the structure(s) of interest, e.g., start at 0 for viewing the fundus.

By adjusting the focusing distance of the direct ophthalmoscope, the examiner may use the instrument to examine all visible intraocular structures. Its most common use is in examination of the posterior portion of the globe. When the vertical dial is set on 0, subtracting diopters (i.e., -1, -2,-3, etc.) moves the focal point away from the viewer. Conversely, when diopters are added (e.g., +1,+2,+3, etc.)

the focal distance is brought closer to the viewer. Note: if the examiner normally wears corrective eyewear, and removes his/her glasses when performing direct ophthalmoscopy, the refractive power of the examiner will need to be adjusted for (thus, the diopter power needed to achieve focus for various ocular structures may vary slightly from person to person).

Indirect ophthalmoscopy involves using a focused light and a condensing lens (20–15 diopters) to view the fundus. A head-mounted light source combined with a set of prisms may be used and provides the viewer with a binocular view. A hand-held light may also be used. A Finoff transilluminator is recommended as a focal light source for performing monocular indirect ophthalmoscopy. See the attached table for comparing the advantages and disadvantages of direct and indirect ophthalmoscopic techniques.

The vitreous is examined for congenital remnants (retained hyaloid structures) and other opacities (degenerative materials, hemorrhage or exudates). Examination of the fundus involves studying the optic disc (papilla), retinal vessels (note that horses have a paurangiotic retina with short retinal vessels extending only a few millimeters from the optic nerve head), tapetal fundus (tapetum), and nontapetal fundus (nontapetum). Fundus examination should begin by identifying the optic disc and by evaluating its size and shape. The horse's optic nerve is located slightly oval in the horizontal direction and located just ventral to the tapetal-nontapetal junction. The tapetum, the upper, brightly-colored portion of the fundus, will have variable color depending on the horse's skin coloration. For example, it is not uncommon to see red and green tapetal coloration patterns in Paint horses.

Abnormal equine funduscopic findings are quite varied and include abnormalities of the optic disc, chorioretinal scars, and retinal detachment to name just a few. A complete discussion of equine ocular disease is well beyond the scope of these notes. Therefore, the reader is referred to the suggested reading below for a more thorough discussion of abnormal equine ophthalmic examination findings.

Tonometry

Intraocular pressure (IOP) measurement, or tonometry, is indicated in horses that have corneal edema, a red or painful eye, orbital trauma, a history of glaucoma in the opposite eye, a lens luxation, and for diagnosing glaucoma (elevated pressure) and uveitis (low pressure). It is also very useful in assessing response to therapy when treating any of the aforementioned ocular conditions.

Applanation tonometry (Tonopen) provides accurate and reproducible intraocular pressure readings in veterinary patients and is becoming increasingly used in general equine practice. Applanation tonometers have several advantages over the Schiotz tonometer. They are highly accurate, their readings are less affected by corneal disease, they can be used to measure intraocular pressure in vertically as well as horizontally positioned corneas, and are very easy to use, making them the instrument of choice for measuring intraocular pressure in domestic animals. There are many different studies examining normal intraocular pressures in horses and the effects of systemic sedation, head position, eyelid blocks, etc and the reader is referred to the suggested reading for more details. The mean normal equine IOP ranges from 15 to 30 mm Hg, with the IOP of the left and right eyes of any given horse being within 5 to 8 mm Hg of each other. An IOP greater than 30 to 35 mm Hg is usually diagnostic of glaucoma.

Other (More Advanced) Examination and Diagnostic Procedures

- Aqueous paracentesis
- Vitreous paracentesis
- Retinoscopy
- Fluorescein angiography
- Corneal esthesiometry
- Ultrasound pachymetry
- Specular microscopy
- Gonioscopy
- Electroretinography
- Ocular ultrasonography
- Radiography, MRI, CT

Comparison of Ophthalmoscopic Techniques

Direct ophthalmoscope	
Advantages 1. Portability 2. Inexpensive 3. Image more magnified 4. Direct upright image	**Disadvantages** 1. Decreased penetration of cloudy media 2. Small field of vision 3. Short working distance (closer to the animal's head) 4. No stereopsis 5. Inability to examine peripheral retina
Binocular indirect ophthalmoscope	
Advantages 1. Larger field of view 2. Greater distance from patient's head 3. Stereopsis 4. Light penetrates cloudier media	**Disadvantages** 1. Inverted reversed image 2. More expensive than direct ophthalmoscope
Focal light source and lens as ophthalmoscope	
Advantages 1. Inexpensive 2. Portable 3. Large field of view 4. Distance from patient's head	**Disadvantages** 1. No stereopsis 2. Inverted reversed image

KEY DRUGS, DOSAGES AND INDICATIONS

Key Drug	Drug Class	Dose Range	Frequency	Route	Indications
Tropicamide	Parasympatholytic, short-acting mydriatic	N/A	1 drop	Topically to corneal surface	To achieve pupillary dilation in a normotensive eye for complete posterior segment examination
Proparacaine	Depolarizing topical ocular anesthetic	N/A	1 drop	Topically to corneal surface	Prior to tonometry or ocular cytology
Lidocaine	Amide-type local anesthetic	N/A	1 to 2 ml of a 2% solution	Local injection	Eyelid blocks

SUMMARY

- When presented with any ophthalmic abnormality, concern for the horse's vision and ocular comfort should guide the practitioner's diagnostic and therapeutic plan.
- The patient should be examined first at a distance, and then at eye level in both bright and dark lighting.
- The complete ophthalmic exam with its "minimal ophthalmic data" should be acquired during all ophthalmic examinations with some exceptions for the horse (discussed in lecture).
- Components of the **minimum ophthalmic data** base include: menace response, direct and consensual pupillary light reflex, palpebral reflex, Schirmer tear test, fluorescein stain, and tonometry.

- Additional ocular diagnostic procedures routinely performed by the general practitioner include nasolacrimal flushing, conjunctival/corneal swabs for cytology and culture, and conjunctival biopsy.
- Techniques for commonly performed eyelid blocks will be reviewed during lecture and the laboratory session offered at the 2010 WVC.

REFERENCES

1. Gilger BC (Editor) *Equine Ophthalmology*. 2005, Elsevier Inc. ISBN: 0-7216-0522-2. Please note that a new edition of this textbook will be available in 2010.