The Ophthalmic Examination

Equine

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INTRODUCTION

- There are enough special characteristics to an equine ophthalmic examination that it is important to address this topic individually.
- Some techniques used in other species, namely the dog and the cat, can apply but usually require adaptation.
- Even though the equine eye is much larger than a cat or dog eye it can be much more difficult to examine. This is mainly because of the size and strength of the animal. In addition to the increase in ocular size also comes a much larger and stronger orbicularis oculi muscle.
Prior to any examination a good history is essential. Questions not only relating to the chief complaint and recent history, but also to previous ocular problems with this animal and relatives as well as any current or past problems with animals stabled in the same environment.

A complete history will often aid in determining the nature and cause of the problem by assisting the examiner in knowing where to place the emphasis during the examination and perhaps direct the laboratory submissions as well.
The Ophthalmic Examination
The examination environment is important and can greatly influence the examination results. In an environment that is too distracting and bright, a complete careful examination cannot be done; especially in an animal that is unruly.

Safety for the examiner and his assistants is also a major concern and will be diminished if the environment is not adequate.

Try to locate a non-confined area that is away from the general activity, provides adequate lighting which can be reduced when necessary, and ideally has a firm structure to secure the halter lead to if necessary.

A model examination area would consist of a room or area that could be isolated, and included a stocks with a non-slip floor.
Introductory Examination Process

• Initially a cursory physical examination and gross examination of the head and ocular region prior to any sedation or local anesthesia is advisable.
First and foremost one should determine if the animal is sighted

- The menace response is acceptable, but even prior to that, note how the animal is reacting to its surroundings. For example, how the animal behaves while being unloaded from a trailer, or while turned out in the paddock. Watch carefully as the animal is being led on a lead and how it reacts to other animals and its environment.
First and foremost one should determine if the animal is sighted.

- An obstacle course would be ideal yet in my experience it is not always practical. Ideally, evaluation in dim light should also be allowed, especially with the Appaloosa who can be affected by Congenital Stationary Night Blindness (ENB).
First and foremost one should determine if the animal is sighted

- The history with these animals will commonly include frequent trauma and difficulty navigating at night or in dim light. These animals will not have any ophthalmoscopy lesions. An electroretinogram (ERG) is necessary to confirm the diagnosis; however, in the absence of an ERG, considering the breed, history and clinical findings, a diagnosis of ENB can be strongly suspected.
Vision Testing

The **menace response** is a learned response which will not generally be present in foals less than two weeks of age. A hand or finger(s) thrust is made toward the eye, avoiding setting up stimulating air currents, or touching tactile hairs (vibrissae). The reflex blink is the end point. Therefore, the seventh cranial nerve and orbicularis oculi muscle must also be intact along with visual pathways up to and including the cortex. When performing this test the examiner should stand on one side of the animal to assure that his hand motion is not in the visual field of the contralateral eye. The strength of the blink response can be **amplified** by actually touching the periocular region on the first one or two thrusts and then stopping short of this on the next two or three. Some animals need to be reminded, if you will, that the thrusted finger may touch them.
Vision Testing

- Throwing cotton balls, wads of cotton or a glove in the air can be helpful in visual assessment but it is not always reliable.
Vision Testing

- The end point with this method would be head motion and/or reflex blink, which can be subtle. The examiner needs to be assured that the object thrown is large enough to be seen, that the object does not make a noise, set up stimulating air currents, nor is thrown into the visual field of the opposite eye. A few repeated responses are necessary to avoid interpreting a coincidental blink or head motion with a positive sign. Too many stimuli in a row, however, will progressively lessen the blink response.
Vision Testing

- Throwing Cotton Balls
Gross Evaluation

- Symmetry
- Ocular discharge
- Normal Position of the Upper Eyelid Cilia
- Ptosis
- Blepharospasm
- Photophobia
- Surface Topography
- Pupillary symmetry
Symmetry

- Evaluate symmetry of the head and facial expression. Step back and compare the palpebral fissures for their size and congruity. Check the ocular motility, position of the upper eyelid cilia and lids.
Ocular discharge

- **Ocular discharge** if present should be characterized as serous, mucoid, purulent, hemorrhagic, seromucoid, mucopurulent, or serosanguinous.
Normal Position of the Upper Eyelid Cilia

- The position of the upper eyelid cilia normally should be directed nearly perpendicular to the corneal surface.
Subtle Ptosis

- Subtle ptosis or drooping of the eyelid without noticeable narrowing of the fissure, as seen with Horner's or partial facial palsy, would be detected by observing the more ventrally directed cilia.
Blepharospasms

- Blepharospasm (forced blinking) is usually a sign of ocular pain and commonly is also associated with an ocular discharge.
Photophobia

Ocular pain that results in blepharospasm can stem from superficial sites (eg: cornea) or deep intraocular ones (eg: uvea-ciliary spasm). Intraocular inflammation will make the animal have a light (dazzle) induced (reflex blink) blepharospasm; commonly referred to as photophobia.
Surface Topography

- Surface topography of the periorbital and ocular structures such as eyelid creases and folds, as well as the supraorbital fossal depression may be accentuated or lost. Conditions resulting in enophthalmia such as a painful globe or a globe undergoing atrophy (phthisis bulbi) and loss of orbital contents due to emaciation, muscle atrophy (denervation, post inflammatory) would emphasize these topographical structures.
Surface Topography

• Conversely, conditions that would increase the orbital contents such as inflammation, hemorrhage or obliterate these. Glaucoma would diminish and/or obliterate these. Careful comparison of both orbital and periorcular areas, along with the appreciation of these surface topographical structures, can assist in the early recognition of ocular problems.
Palpation

- **Palpation** of the orbital zone is also important to confirm topographical changes and characterize them as hard or soft, moveable or fixed, and sensitive or insensitive. Percussion of the frontal and maxillary sinus area may be indicated, especially in animals with orbital disease. A stethoscope is helpful to critically assess the sounds generated during percussion and certainly comparison of both sides will identify subtle fluid accumulations.
Retropulsion

- **Retropulsion** or pushing the globe deeper into the orbit through the closed eyelids is a technique that is used to determine if there is an abnormal amount of orbital contents. Resistance to retropulsion, especially as compared to the contralateral orbit would signify increased orbital mass and perhaps a localization of a focal swelling could be identified with this method combined with the direction of any apparent deviation of the globe. This technique would not of course be used in an eye that is in danger of rupture. The maximal amount of valuable information gained from the findings of these procedures results when the examiner is familiar with the normal bony and soft tissue anatomy.
Palpation

- **Palpation** used in a *stimulatory* manner (Palpebral Reflex) to evaluate sensory and motor nerve function is important to evaluate the fifth, sixth and seventh cranial nerves. Touching the periocular area should normally produce a blink reflex, verifying that the fifth and seventh cranial nerves are intact as well as the orbicularis oculi muscle.
Corneal Reflex

- Touching the cornea with the wisped end of a cotton tipped applicator (Corneal Reflex) will evaluate the ophthalmic branch of the fifth nerve and a normal reflex will elicit a head jerk, blink and retraction of the globe with secondary prolapse of the third eyelid. The later two reflexes occur with an intact sixth nerve.
Pupillary symmetry

- **Pupillary symmetry** can be evaluated by viewing the animal head on from about 6 feet through a direct ophthalmoscope set at 0 diopters and stimulating a tapetal reflex.
Next a bright focal light shown directly into the pupil from about two to three centimeters should elicit pupillary constriction (PLR), or the direct pupillary light reflex. At the same time, the fellow pupil should also constrict, resulting in the consensual pupillary light reflex. Observation of this reflex may require a second person due to the lateral placement of the globes. The equine pupil responds slower than the cat or dog and as with all animals, its presence does not confirm sight. Just as the lack of a reflex does not necessarily mean the eye is not sighted.
Finnoff Transilluminator

Excitement or opacity of the ocular media from blood, pus or cataract will not override the reflex from a bright focal light source.
Inexpensive Lights
Intermediate Examination Process

- Now a more thorough evaluation of the external eye can be done and systemic analgesic/sedatives could be given at this point if deemed necessary, which will not affect the subsequent portions of the examination.
- Xylazine is well tolerated and very effective for this purpose.
- 100 - 250 mg given intravenously will calm most horses greater than 1000 # and after 3 - 5 minutes will provide 20 - 30 minutes of analgesia to give optional periocular nerve blocks and/or evert the eyelids. Use of an neck twitch or lip twitch is also often necessary during the moment of more uncomfortable examination procedures. Such as, at the time the periocular nerve block injections are made, eversion of the eyelids, especially the third eyelid and perhaps when the nasolacrimal system is flushed.
Close Inspection

For the majority of the examination minimal restraint is usually optimal and holding the horse by the halter seems to work well. Close evaluation of the eyelid margins, conjunctiva, cul de sacs and cornea for abnormalities can effectively be done with a bright light source and magnification. A head loupe such as an "Opti-Visor" is very helpful in addition to an adequate light source.
Close Inspection

- or the use of an otoscope without the cone. The otoscope will provide a 3x – 5x magnification and a powerful light source all in one.
Opacities in the Ocular Media

- With the direct ophthalmoscope set at 0 diopters and viewing the eye from a distance of about one to two feet, an evaluation of the ocular media for opacities.
Opacities in the Ocular Media

- The best situation is when the pupil is dilated artificially with tropicamide (1%) – do not use atropine for diagnostic purposes. Most horses have a mid range pupil at rest and especially so in dim light. This will allow the examiner to briefly evaluate the lens and vitreal space in this indirect manner for synechiae, cataracts, vitreal floaters and retinal detachments.
Opacities in the Ocular Media

- Later, when it is more appropriate to use a mydriatic, this indirect examination with the direct ophthalmoscope can be repeated when the pupil is large.
- Opacities of the ocular media when viewed in this manner, against the tapetal reflex, will appear grey to black, irrespective of their true color. Opacities that are anterior to the center of the lens will move in the same direction of the globe and ones posterior to the center of the lens will move in the opposite direction. Retinal detachments, if large will be seen easier with this method than looking directly.
Ocular Opacity
Focal Beam Examination

- Using a focal beam and or a slit beam directed into the eye at an angle evaluate the anterior chamber. Evaluation of the chamber contents and depth are essential as well as the character of the pupillary margin with regard to adhesions of the iris to the lens and pigment deposits on the anterior surface of the lens and the physical condition of the corpora nigra.
Slit Light Examination
Localization of an opacity

- Slit Light Examination
Localization of an opacity

- Slit Light Examination
Flare

- The aqueous is normally optically clear. When the blood aqueous barrier is broken down due to inflammation, the aqueous becomes more like plasma, or *plasmoid*. If a focal light is then shown in to the eye from an angle, the light will reflect off the protein and or cells as a haze or dust when there is flare or if inflammatory cells are present, respectively. Occasionally when inflammation is severe, frank blood, hyphema may be present. Observation of the beam or slit of light passing through the anterior chamber with the aid of magnification (*head loupe*) increases the observers ability to see these changes.

- If the ambient light can not be dimmed in the examination area a soft black tarp can be used to cover over the horses head and the examiner.
Retinal Examination
Direct Ophthalmoscopy

- At this point the examiner can move close (1-2") and focus on the retina by adjusting the diopter wheel (usually 0 to -3). The optic disc is located in the inferiortemporal region of the fundus. The magnification is about 15 times and the field of view is slightly larger than the optic disc.
Direct Ophthalmoscopy

- Most inexperienced examiners usually get a good view of the tapetal retina and disc but not the nontapetal zone.
- The nontapetal zone is often overlooked, because the animal's head is elevated too high and the color is boring and dark, as compared to the bright and relatively colorful tapetal retina.
- The nontapetal retina usually is affected with more chorioretinitis lesions than the tapetal retina and therefore is an area that can not be overlooked.
Direct Ophthalmoscopy

- After the retina has been evaluated the examiner can move the diopter wheel to more positive numbers to evaluate the vitreous and lens. This instrument is a bit cumbersome for these structures because the depth of field at this magnification is so narrow.
Indirect ophthalmoscopy

- **Indirect ophthalmoscopy** can also be done using a bright hand held light source and a hand lens (5 - 7 x).

- A bright light source such as a 3.5 volt halogen handle with a Finnoff transilluminator or a Welch Allen halogen penlight would be fine choices. The hand lens could be as simple as a 7 - 5 x (28 - 20 diopter) Bausch and Lomb plastic lens or a aspheric 20, 2.2 or 28 diopter lens.

- The 28 diopter lens will give a larger field of view and less magnification, while the 20 diopter lens will give a smaller field of view and greater magnification. The 2.2 lenses is about 24 diopters, and gives a field of view similar to the 28 diopter lens but a magnification closer to a 20 diopter lens.

- A binocular indirect ophthalmoscope is ideal because the examiner also can appreciate depth because the image is three dimensional; yet, hand held monocular indirect ophthalmoscopy is a very effective method.
Indirect ophthalmoscopy
Subsequent examination techniques that involve manipulations, especially in an animal that is already exhibiting signs of ocular pain usually require the additional assistance of one or several periocular nerve blocks.

To relieve spastic contractions of the eyelids, periocular akinesia can be achieved by blocking the auriculopalpebral nerve.
Periocular Nerve Block 1
Periocular Nerve Block 1
Periocular Nerve Block 1
Periocular Nerve Block Method 1

- Inject 0.5 - 1 ml of 2% lidocaine at the crest of the zygomatic arch. A 25 x 5/8" needle should enter at a point just below the arch and penetrate until the tip hits the bone, then slide needle forward until the tip is at the crest of the arch. Attach a 1 cc syringe to the needle and fan out the injection of 0.5 - 1 ml of anesthetic at the crest of the arch. Remove the needle and massage in the bleb of anesthetic.
Periocular Nerve Block 2

- Palpate a cord of tissue at the lowest point of the cranial portion of the zygomatic arch and place 0.5 ml of 2% lidocaine there.
**Periocular Nerve Block 3**

- Find the supraorbital foramen by placing your thumb on the superior orbital rim and your middle finger on the edge of the supraorbital fossa; then slide your hand medially and as your two fingers separate; drop your index finger down to touch the skull. Usually your index finger will fall into the foramen at this point, unless you are dealing with a draft horse.

- Once the foramen is located, place a 25 guage by 5/8" needle through the skin starting about 1/4" from the foramen and travel tangentially to the foramen until you perceive that the needle tip is over the foramenal opening. Place 0.5 ml of 2% lidocaine over the opening of the foramen. There is a branch of the auriculopalpebral nerve that passes over the surface of the foramen and this block will provide mostly akinesia of the upper lid with some analgesia to the central upper lid.
Periocular Nerve Block 3
Periocular Nerve Block 3

- If more analgesia of the central upper lid is needed then anesthetic needs to be placed into the foramen.
- The auriculopalpebral block does not provide any analgesia and if eyelid analgesia is necessary a sensory nerve block should be used.
Sensory Blocks

1. Frontal nerve
2. Lacrimal nerve
3. Zygomatic nerve
4. Infratrochlear nerve
5. Ophthalmic nerve
Special Examination Procedures

- Culture
- Schirmer Tear Test
- Sodium Fluorescein
- Eversion of Lids (Foreign Body Search)
Culture

- A culture sample should be taken early in the exam and especially prior to instillation of fluorescein, topical anesthetics, mydriatics or eye wash with preservatives.
- If there is a copious amount of purulent discharge it is wise to either swab it out with a sterile applicator prior to collecting a sample for culture or irrigate the discharge out with sterile saline that does not contain preservative (USP saline, IV saline, etc.). Culturettes are good for collecting and transporting a culture sample.
- The tip of the culturette should be moistened in the attached media first by simply breaking the attached ampule, followed by eversion of the lower eyelid with the thumb and firmly inserting the applicator tip into the central cul-de-sac with a twisting motion so as to collect the superficial conjunctival epithelial layers that would be harboring the significant pathogens. Resist touching the eyelid margins with the culturette. for, organisms collected from the eyelid margin may not be involved with the ocular problem and may be confusing.
Culture
Tears

- Quantitative evaluation of tear production is not commonly done due to the uncommonness of keratoconjunctivitis sicca in the horse. If however, a Schirmer Tear Test needs to be done, this would be the time to do it; prior to the instillation of any topical solutions, especially an anesthetic and also prior to administration of a systemic analgesic/sedative.

Values of greater than 15 mm/min. of wetting are considered normal and in fact, normal values are commonly in excess of 15 - 20 mm in 30 seconds. It is wise to compare one eye with the other to help access subtle deficiencies.
Sodium Fluorescein

- In order to identify breaks in the epithelial surface of the conjunctiva or cornea, sodium fluorescein is used to identify the de-epithelialized areas.
- Sodium fluorescein is an easily observable water soluble fluorescent dye that is retained in de-epithelialized areas.
- The agent is available impregnated in individual sterile strips. The strip should not be touched directly to the cornea and application can either be by wetting the strip with eye wash and applying a drop of the fluorescein solution to the lid margin directly from the strip or by squirting it from a syringe onto the eye. This can be done by placing a fluorescein strip into the barrel of a disposable syringe with an attached needle hub (needle broken off flush with the hub). Eye wash is added to make a small amount of fluorescent solution and then the solution squirted onto the eye from a distance of at least six inches. Be careful, the hub of the disposable needle still has a small fragment of needle and could injure the eye.
Sodium Fluorescein
Sodium Fluorescein

- Fluorescence will occur with sun light, white light, cobalt blue light or a black light.
- Very deep corneal lesions such as descemetoceles will not retain fluorescein because Descemet's is lipid in nature. Care should be exercised in handling these eyes for they are likely to rupture with a squint after the initial sting of the fluorescein when it is first applied to the eye.
Topical Anesthesia

- Topical anesthesia in ophthalmology refers to the application of a anesthetic on the surface of the eye to alleviate minor discomfort from manipulations that the patient would ordinarily not tolerate otherwise. Eversion of the eyelids including the third eyelid, conjunctival scraping and biopsy, corneal scraping, nasolacrimal drainage apparatus manipulations and suture removal, would be examples of techniques that would necessitate this drug, in addition to sedation and possibly nerve block.
Topical Anesthesia

- Common ophthalmic topical anesthetics are, proparacaine 0.5% (Ophthaine, Alcaine, Ophthetic), tetracaine 0.5%, and benoxinate 0.4%. Proparacaine is by far the most commonly used and is the least toxic of the three.

- **TOPICAL ANESTHETICS ARE ONLY FOR DIAGNOSTIC PURPOSES AND NEVER SHOULD BE DISPENSED BECAUSE THEY ARE TOXIC TO THE CORNEAL EPITHELIUM AND MAY MASK THE INCITING ETIOLOGY!**
Topical Anesthesia

- There is a limit to the magnitude of analgesia provided by a topical agent. After the topical anesthetic has been applied three or four times, and no further increase in depth occurs; one can then expect only increased duration of effect and toxicity. If after four applications of proparacaine in two minutes there is not enough perceived analgesia for what is being done, then another form of analgesia needs to be added. Such as, xylazine, Torbugesic and/or a lip or ear twitch. The twitch only needs to be applied at the moment of the manipulation for supplementation.
Eyelid Eversion

- Eversion of the eyelids to evaluate the conjunctival cul de sacs can be aided with a muscle hook.
Eyelid Eversion

- “Muscle Hook” This is a smooth relatively atraumatic ophthalmic instrument used in rectus muscle surgery that can be slipped over the lid margin followed by gently pulling the eyelid away from the globe while the examiner observes the condition of the conjunctival surfaces with a bright light and magnification. A Senn Retractor is also good.
Eyelid Eversion

- A Senn Retractor (smooth end) is also good.
Eyelid Eversion

- Topical anesthetic after an auriculopalpebral block is usually necessary to do this. Some horses resist this instrument, yet have long and firmly fixed vibrissae that can be carefully used to draw the eyelid away from the globe, accomplishing the same goal of being able to look into the full extent of the cul-de-sac without using an instrument. Some foreign bodies can not be observed with out doing this. For, just rolling the eyelid margin out with the thumb, for example, will allow visualization of the proximal palpebral conjunctival and at the same time compress the deeper cul de sac.
The third eyelid can also be everted to look on the bulbar surface. Simply grasping the palpebral surface below the free margin with a serrated or fine rat toothed forceps (delicate Adson's 1 x 2) works well. Avoid grasping over the free margin because of the potential for damage to the cornea. With either instrument, be ready to release quickly in case the animal bolts.
Intraocular Pressure Measurement

- Digital Tonometry
Intraocular Pressure Measurement

- Applanation Tonometry (Tonopen XL)
Fluorescein can also be used to evaluate the patency of the nasolacrimal drainage apparatus. A generous application with additional eye wash will usually result in the appearance of dye in the distal nasal cavity after a few minutes. If the animal has a clinical sign of tears or ocular discharge and especially if there is no passive flow of fluorescein to the nose, the nasolacrimal system can be flushed.
Nasolacrimal System

- Cannulation can be either via a punctum with a 3.5-F. Monoject Sovereign Tom Cat Catheter (Sherwood Medical) or through the nasal opening of the nasolacrimal duct and up the duct with a 5- or 8-F infant feeding tube (Pharmaseal --Pharmaseal, Inc) about 5 to 10 CM. Gentle irrigation with preferably warm eyewash delivered with a syringe works well. Most average sized horses will accommodate a 5 French size and larger animals such as a draft horse may need an 8 French. **Do not force** and watch the respective distal opening for the first flow to characterize the material exiting.

- It is not uncommon to see a purulent discharge initially that may be collected for culture and/or cytology as well as observation of an exiting foreign body such as hair, a seed or an awn.
Conjunctival Cytology

- Occasionally it is necessary to perform a conjunctival scraping for cytology to characterize the inflammatory response and evaluate for bacterial organisms or evaluate for neoplastic cells or parasitic organisms. This can be done with a chemistry spatula, a Bard Parker Scalpel handle tip (part that accepts the blade but without a blade attached) a Kimura spatula or the butt end (end opposite the sharp blade end) of a scalpel blade. The butt end of a #15 scalpel blade.
Conjunctival Biopsy

- Biopsy of the conjunctiva for histopathology and or parasite evaluation can be performed on a standing horse after xylazine, auriculopalpebral nerve block and either a topical anesthetic or a subconjunctival (sublesional) injection of 2% lidocaine (0.1 cc). At the time of the subconjunctival injection and when the tissue to be biopsied is picked up with a fine rat toothed forceps, the application of a lip or ear twitch is usually necessary and advisable. A quick snip with a fine scissors (tenotomy) will provide a good sample. Avoid aggressive large biopsies of the conjunctiva, for prolapse of orbital fat could occur or suture the wound after the biopsy.
Corneal Cytology

• Sampling of a corneal ulcer bed for culture usually requires a scraping with a spatula to obtain an adequate amount of material. Ideally, this should be done prior to the application of fluorescein or topical anesthesia due to the possibility of a bacteriostatic/cidal effect from these chemicals. If a sample cannot be obtained without topical anesthesia then anesthesia can be used. Proparacaine (0.5%) is suitable, because it has a rapid onset, is less toxic than others and has been designed for the eye.
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