

## **The Technician Role in Ophthalmology Cases**

### History/Taking Phone Calls

Fielding calls from owners and referring veterinarians is a vital part of any ophthalmology practice. The first and most important question should determine if the situation is emergent. If the situation is not an emergency a brief history can be taken. If they believe the situation is an emergency it is important to try to determine what the problem is. This sounds simple but can be quite difficult when speaking with an owner or a referring veterinarian with little ophthalmology experience. When talking to a referring veterinarian I usually keep the questions brief and make sure to hit the major points: problem, duration, treatment, and progress. When talking to an owner it can be more difficult to acquire the important information. If another veterinarian has seen their horse I will take their information and ask permission to call them as well. My usual line of questioning for owners is listed below:

1. How long has this particular problem been going on?
2. Has your horse had previous ocular problems that you know of?
3. When looking at your horse from the front, how open is the eye (percentage compared to the other eye)?
4. Is the horse's face wet or is there just some discharge at the corner of the eye?
5. If you can see the cornea can you see any color changes?
  - a. Red-vessels
  - b. Blue-edema
  - c. Yellow-infection
6. Is the horse trying to rub his face?
7. What medications (topically and systemically) have you used?
8. How often are you giving the medications?
9. Has there been any improvement/worsening?

### Examination Environment and Preparation

The environment the ocular examination is performed in helps to determine the quality of the exam that can be performed. The exam should be performed in a dark area, ideally a wash stall or area without windows. If that is not available, trash bags can be used to cover the windows. If there is no shelter the examination can be scheduled early or late in the day so that it is less bright.

Depending on the horse's comfort level and behavior, many examinations can be done with the help of a good handler. If brief restraint is needed a nose twitch is useful in many situations. If sedation is needed for a brief examination I will start with xylazine (0.3- 0.5 mg/kg IV). If the eye is fragile, extremely painful, or a standing procedure needs to be performed detomidine is recommended (0.01-0.02 mg/kg IV).

### Instruments Needed for Exams

- Ophthalmic examination sheet
- Finoff transilluminator
- 20 D condensing lens
- Direct ophthalmoscope
- Tonometer

- Fluorescein stain
- 1% Tropicamide
- 0.5% Tetracaine
- Culturette
- Microscope slide
- 10 blade
- Eye wash

Allbaugh RA. (2013 December). *How to perform a thorough eye exam in the field*. Paper presented at AAEP: Ophthalmology How-To Session, Nashville, TN. (pp. 145-148).

### Ophthalmology Diagnostics

There are a few tests that are done routinely during an initial ocular examination. Fluorescein stain is another diagnostic that is commonly performed. This can be used to diagnose corneal ulcers or corneal perforation, assess nasolacrimal duct patency, and determine tear film break up time. Fluorescein dye is lipophobic and hydrophilic. These characteristics prevent adherence to intact epithelium; however, breaks in the epithelium will result in stain adherence to the exposed stroma. Application of stain to the cornea will also assess nasolacrimal duct patency and this is referred to as the Jones test. It generally takes 5-20 minutes for stain placed on the cornea to travel through the lacrimal puncta into the nasolacrimal duct and be visualized at the external meatus. The external meatus can be easily seen in the horse at the mucocutaneous junction on the nasal floor. The final test that is commonly performed with Fluorescein dye is the tear film break up time. To perform this test, stain is applied to the cornea and then the eyelids are blinked twice. The eyelids are then held open and the stain should start to evaporate at ~9 seconds<sup>2</sup>. If the stain starts to evaporate prior to that time, instability of the mucin layer is suspected.

The Schirmer tear test measures the amount of tears produced in one minute. Normal is generally accepted as >15 mm/min, however, horses frequently have results that are off the strip within seconds (>30 mm)<sup>1</sup>. It is important to note that just because the quantity of tears is normal it does not mean that the quality of tears is normal.

An important diagnostic that is less available in the field is tonometry. There are two common tools used in veterinary medicine to measure intraocular pressure (IOP). The Tono-Pen measures IOP via applanation tonometry, which converts the force required to flatten the cornea into mmHg<sup>4</sup>. The TonoVet measures IOP via rebound tonometry, which analyzes motion parameters of the probe after collision with the cornea<sup>5</sup>. Normal intraocular pressure for horses is 15-25 mmHg. Decreased intraocular pressure is often due to inflammation. Glaucoma is defined by increased intraocular pressure and should be treated immediately to prevent complications such as retinal detachment.

Even further diagnostics can be pursued depending on the presenting complaint. Corneal ulceration often warrants cytology and culture. Application of 0.5% proparacaine can facilitate these diagnostics in a painful eye. Cytology can be performed with either a cotton swab or the blunt edge of a scalpel blade. The collected material is then smeared onto a slide and examined for infectious organisms. Ocular ultrasound is most commonly used to rule out retinal detachment. We suspect retinal detachment in nonvisual cases of uveitis. Another common use

for ocular ultrasound in horses is evaluation of extraocular masses. Results of ocular ultrasound can help determine what treatments are necessary.

1. Beech J, Zappala R, Smith G, Lindborg S., 2003. Schirmer tear test results in normal horses and ponies: effect of age, season, environment, sex, time of day and placement of strips. *Veterinary Ophthalmology* 6, 251-254.
2. Monclin SJ, Farnir F, Grauwels M, 2011. Determination of tear break-up time reference values and ocular tolerance of tetracaine hydrochloride eyedrops in healthy horses. *Equine Veterinary Journal* 43, 74-77.
3. Kalf K, Utter M, Wotman K, 2008. Evaluation of duration of corneal anesthesia induced with ophthalmic 0.5% proparacaine hydrochloride by use of a Cochet-Bonnet aesthesiometer in clinically normal horses. *AJVR* 69, 1655-58.
4. Iliev, Goldblum, Katsoulis et al, 2006. Comparison of rebound tonometry with Goldmann applanation tonometry and correlation with central corneal thickness. *Br J. Ophthalmol.* 7, 833-35.
5. Knollinger, La Croix, Barrett, Miller, 2005. Evaluation of a rebound tonometer for measuring intraocular pressure in dogs and horses. *J Am Vet Med Assoc.* 227, 244-8.

#### Nerve Blocks Common in Ophthalmology

The auriculopalpebral block is the most common periocular block performed. It reduces motor innervation to the upper eyelid via temporary paralysis to the orbicularis oculi muscle. It can be applied to facilitate an easier examination or procedure. The only situation where this block should be cautiously performed is in a horse with facial nerve paralysis where the nerve has already been damaged. In this situation an auriculopalpebral block is unnecessary because the palpebral response is diminished or absent. The auriculopalpebral block can be performed by injecting 2-4 milliliters of anesthetic along the nerve. There are 3 locations this can be done: the depression at the base of the ear, at the highest point of the caudal zygomatic arch, or at the lowest point of the zygomatic arch temporal to the orbit.

To block sensation to the upper eyelid the supraorbital foramen, where the supraorbital nerve exits, can be palpated by placing your index finger at one canthus and your ring finger at the other canthus. The middle finger will then naturally lie at the supraorbital foramen. Local anesthetic can be instilled in this area at a volume of 2 milliliters.

To block sensation to both the upper and the lower eyelids a ring block can be performed. To perform this block ~10 milliliters of anesthetic can be placed ~2cm from the eyelid margin circumferentially using 25 gauge needle.

The most common ophthalmic anesthetics are tetracaine and proparacaine. The benefit of tetracaine is that it does not have to remain refrigerated like proparacaine. In the absence of ophthalmic anesthetics, lidocaine and bupivacaine can be used. Mepivacaine is a very poor corneal anesthetic<sup>1</sup>. If topical anesthetics are ineffective alternative options are subconjunctival or retrobulbar mepivacaine, lidocaine or bupivacaine. Subconjunctival anesthetics can be performed using a 26 or 27 gauge needle and a 1 cc syringe. Approximately 0.5 milliliters of an anesthetic is injected into the subconjunctival space. The author usually does this over 90 degrees closest to the lesion.

1. Pucket, J.D., Allbaugh, R.A., Rankin, A.J., Ou, Z., Bello, N.M. (2013) 'Comparison of efficacy and duration of effect on corneal sensitivity among anesthetic agents following ocular administration in clinically normal horses' *American Journal Veterinary Research*, 74, 459-464.

### Subpalpebral Lavage Placement

Placement of a subpalpebral lavage (SPL) can be necessary to facilitate medical treatment for ocular disease in horses. This device is used in horses due to their large size and extraordinarily strong orbicularis oculi muscle. Currently there are commercially available SPLs through MILA International. The catheter systems consist of a 12-gauge trocar and a catheter with an attached footplate. The catheter comes in two sizes: 36 inch and 60 inch. For every subpalpebral lavage placement the eye is thoroughly prepared with dilute betadine solution. Soaked gauze is used to wipe around the eyelids. After the cornea is anesthetized with topical 0.5% proparacaine, dilute betadine is applied to the cornea and conjunctiva via a syringe with the needle broken off. The SPL can be placed in either the superiolateral eyelid or the inferiomedial eyelid. The position of the SPL determines the nerve blocks necessary. To place a superiolateral SPL an auriculopalpebral (motor) and a supraorbital (sensory) nerve block should be performed. To place an inferiomedial SPL an auriculopalpebral and local lower lid nerve block should be performed. The SPL is aseptically placed in the location of choice. After placement of the catheter it is important to check the position of the footplate to ensure that it is correctly placed and tight against the palpebral conjunctiva. The catheter is then sutured to the head making sure that the tubing is never severely bent, which can lead to micropuncture. It is also important that the word MILA (on the catheter tubing) can be seen just outside of the eyelid. This assures us that the position of the footplate has not changed and is especially important when the SPL is placed in the upper lid. If the footplate slips out of position a corneal ulcer can occur. Another SPL complication is a lid abscess. This usually occurs within a few days of SPL placement. In a retrospective study of 101 horses with SPLs placed, 10% were diagnosed with either a corneal ulceration due to the SPL catheter or a lid abscess<sup>1</sup>. The lid swelling associated with an SPL abscess can be quite severe but there is rarely discharge. Standard treatment includes administration of trimethoprim sulfamethoxazole (30 mg/kg PO BID) and application of Surpass cream to the eyelid. Complications associated with the SPL can often be avoided by correct placement of the catheter and proper management. The SPL needs to be thoroughly checked every time medications are given. The word "MILA" should always be easily read outside of the eyelid. The sutures should be intact and there should be no slack in the tubing on the horse's head. When injecting the medication it should flow easily and no leaks should be seen. The injection cap should be wiped with alcohol prior to every injection and the cap should be changed every 3 days to help maintain sterility of the tubing. Administration of medications can be done in two different ways. The first method is to give the medication and then follow the medication with a syringe of air. This method is effective, however, the air injection seems to cause corneal irritation and horses may become anxious about SPL treatment. The second method involves loading the line with a series of medications. After the loading process when a medication is injected into the tubing a different medication is pushed into the eye. This method has been shown to be effective in treating ocular disease<sup>2</sup> although it is very likely that the medications mix within the tubing.

1. White S, 1997. Construction and Placement of a subpalpebral lavage system for medication of the eye. How-To session AAEP 43, 160-162.
2. Johns IC, Beech J, Benson CE, Parente LL, 2010. In vitro evaluation of the antibiotic activity of combinations of ophthalmic drugs against common equine ocular pathogens. Journal of Equine Veterinary Science 30, 231-236.

### Setup for Common Procedures

Preparation of the periorbital and orbital tissues should be performed prior to any procedure, including administration of local anesthesia. Dilute betadine solution is created by adding betadine in a 1:50 dilution with sterile saline. The periorbital tissue is cleaned by soaking gauze with the dilute betadine solution and wiping the eyelids. Since dilute betadine is safe for the eye it can be applied to an anesthetized cornea. The easiest way to do this is with a syringe attached to a needle that has been broken at the hub.

The following procedures can be performed under standing sedation with a good handler. Depending on the horse's behavior, xylazine or detomidine can be administered as previously recommended.

A tarsorrhaphy can be performed to help protect a corneal ulcer, control severe chemosis, or protect the globe in a case of facial nerve paralysis. After preparation of the eyelids, an auriculopalpebral block and ring block can be performed prior to the procedure.

The third eyelid can be removed with the combination of topical anesthetic, an auriculopalpebral block and instillation of anesthetic directly into the third eyelid. Preparation of the eyelids and globe should be performed prior to blocking. I generally perform the third eyelid block with sterile gloves ~5 minutes before third eyelid removal. This block can be performed using ~3 milliliters anesthetic via a 27 gauge needle.

The preparation for an eyelid laceration is similar to the preparation for tarsorrhaphy placement. After preparation of the eyelids, an auriculopalpebral block can be performed and then local anesthetic can be placed at the site of the laceration. If the block is instilled through the cut surface of the laceration, the horse will have much less of a reaction versus the needle going through the skin. As little block should be used as possible to avoid distortion of the eyelid.

Eye removal is a very common procedure that can be performed to remove painful and or nonvisual eyes. There are multiple ways to perform a retrobulbar block. The most common reason for performing a retrobulbar block is eye removal. When removing an eye, a four point retrobulbar block does an excellent job. A 20 gauge 3.5" spinal needle with the stylet removed is bent to a C shape. This needle is placed at each corner and then guided within the orbit up to the hub. Anesthetic is injected once the needle is in place (10 milliliters per site).

### Vehicle Stocking

- Antimicrobial
  - NeoPolyBac
  - Chloramphenicol (ointment)
  - Ofloxacin (solution)
  - Cefazolin (solution)
- Antifungal
  - Silver sulfadiazine

- DMSO/Itraconazole (ointment)
- Voriconazole (solution)
- Atropine
- Anti-inflammatory
  - NeoPolyDex
  - Diclofenac
- Flunixin meglumine
- Cetirizine

In general, I recommend ointments if a subpalpebral lavage is not in place because they can be applied at one time and they have a longer contact time which hopefully makes them more effective. If the horse is painful, the globe is fragile, or the owner just cannot medicate properly, a subpalpebral lavage is recommended to easily administer solutions to the eye.

Antimicrobials are probably the group of topical medications with the most variety. Broad-spectrum antimicrobials are most commonly prescribed. These include neomycin polymyxin bacitracin or gramicidin, and chloramphenicol. Neomycin and polymyxin combinations are a good first line of defense choice for routine corneal ulcerations. Fluoroquinolones (ofloxacin, ciprofloxacin) are also broad spectrum but have weaker gram-positive coverage. For this reason, if gram-positive cocci are seen on cytology we will give cefazolin in addition to a fluoroquinolone. Cefazolin has great efficacy against gram positive cocci. Other medications that have a weaker spectrum but are good for possible Pseudomonas infection are tobramycin and gentamicin. Tetracyclines are used more commonly in large animal species where Chlamydophila infections are the primary concern (goats, camelids) but is also a good first line broad spectrum antimicrobial.

Antifungal medications are a very important group of drugs in our equine patients. The efficacy of each antifungal depends of the species of fungus present and also seems to be influenced by geographic location. The most commonly isolated fungal organisms are Aspergillus and Fusarium. In vitro susceptibility testing of isolates from northeastern United States had a low percentage (27.5%) of isolates susceptible to miconazole<sup>1</sup>. However, in vitro susceptibility of isolates from horses with fungal keratomycosis in Florida had a high percentage (77-86%) of organisms susceptible to miconazole<sup>2</sup>. In both studies the fungal isolates were most susceptible to natamycin. Voriconazole is a newer topical azole that has excellent corneal penetration with detectable aqueous concentrations in horses. A recent study of in vitro susceptibility patterns using fungal isolates from the Midwestern and southern United States revealed increased susceptibility of isolates (especially Aspergillus spp.) to voriconazole compared to natamycin<sup>3</sup>.

Topical steroid medications are ALWAYS contraindicated in the case of corneal ulceration. Administration of topical steroids in the face of ulceration can lead to disastrous complications such as infection. Dexamethasone is the most potent topical steroid and the most common choice in our equine patients. Prednisolone is approximately 6 times less potent and hydrocortisone is approximately 25 times less potent than dexamethasone.

Topical nonsteroidal anti-inflammatory medications are also contraindicated in cases of corneal ulceration. Topical NSAIDs impair epithelialization and can delay healing time. The most commonly used topical NSAIDs are diclofenac and flurbiprofen.

Mydriatic drugs are commonly used in many ophthalmic disease processes. They are used to relieve ciliary spasm, which can be extremely painful, and to prevent posterior synechiae in states of uveitis. Tropicamide has a quick onset (~20 minutes) and short duration of action (4-8 hours). For this reason it is good for diagnostic purposes but a poor choice for therapeutic purposes. Atropine has a longer onset (~1 hour), but a longer duration of action and for that reason it is a good therapeutic choice. In normal horses the effect can last for weeks, however, horses with ocular disease may not respond to twice daily administration.

1. Ledbetter EC, Pattern VH, Scarlett JM, Vermeylen FM. In vitro susceptibility patterns of fungi associated with keratomycosis in horses of the northeastern United States: 68 cases (1987–2006). JAVMA 231, 1086-1091.
2. Brooks DE, Andrew SE, Dillavou CL, et al, 1998. Antimicrobial susceptibility patterns of fungi isolated from horses with ulcerative keratomycosis. Am J Vet Res 59:138–142.
3. Pearce JW, Giuliano EA, Moore CP, 2009. In vitro susceptibility patterns of *Aspergillus* and *Fusarium* species isolated from equine ulcerative keratomycosis cases in the midwestern and southern United States with inclusion of the new antifungal agent voriconazole. Vet Ophtho 12, 318-324.

### Genetic Testing

There is a complete list of genetic tests that can be performed at UC Davis and it can be found on their website. [https://vgl.ucdavis.edu/tests?field\\_species\\_target\\_id=266](https://vgl.ucdavis.edu/tests?field_species_target_id=266)

The sample required for testing is 30-50 hairs including the roots. Tests listed for ocular disease include congenital stationary night blindness, distichiasis, ocular squamous cell carcinoma, and multiple congenital ocular abnormalities.

### Histopathology Submission

When submitting a sample make sure to ship the sample and the paperwork in separate bags in case of a spill. The sample should be placed in 10% formalin in a 10:1 ratio of formalin: sample. If the sample is small (<1cm) place in a microcassette with the foam lining. This will reduce your chance of sample loss. If shipping in the winter, add a small amount of ethanol to prevent freezing.

### Taking Photos

It is important when taking pictures that the horse is in a dim environment and it helps to have a second person to hold the horse. A good picture can either be taken with the flashlight feature on or someone holding a flashlight behind the camera. Phone apps that have a flashlight feature include Pro Camera (iphone), Camera 2+ (iphone), and Open Camera (Android).