Proceedings of the American Association of Equine Practitioners - Focus Meeting

Focus on Ophthalmology
Inside the Eye of the Horse

Raleigh, NC, USA – 2012

Next Focus Meetings:
August 4-6, 2013 - Focus on Dentistry
Charlotte, NC, USA

September 5-7, 2013 - Focus on the Foot
Fort Collins, CO, USA

Reprinted in the IVIS website with the permission of the AAEP
http://www.ivis.org
Equine Cataract Surgery

Brian C. Gilger, DVM, MS, Diplomate ACVO

Author’s address: College of Veterinary Medicine, North Carolina State University, Raleigh, NC; e-mail: bgilger@unity.ncsu.edu.

Take Home Message

Although equine cataract surgery is not as routine as human or canine cataract surgery, recent advances in technique has made surgery a viable option for treatment of advanced cataracts in foals and adult horses. Complicating factors, such as pre-existing uveitis and postoperative infection, glaucoma, and lens capsular fibrosis remain areas of concern with the equine patient.

Introduction

Cataracts are a relatively common ocular disease in horses and can occur as both acquired and developmental defects.¹ Acquired cataracts occur in horses of all ages and are frequently secondary to other disease processes, such as uveitis and trauma. Cataracts are the most common congenital ocular anomaly in foals.¹⁻⁵ Cataracts that cause substantial visual deficits can be removed via phacoemulsification and aspiration. Phacoemulsification and aspiration (PA) is the technique of choice for removal of cataracts in foals and adult horses.⁷⁻⁹ Use of an intraocular lens (IOL) in the horse, until recently, has been uncommon. However, newer IOL materials and improved technique has made use of IOLs standard of care for equine cataract surgery.¹⁰⁻¹²

Surgical Assessment

Similar to other animals, workup for a horse that is a candidate for cataract surgery should include a complete ocular (both eyes!) and physical examination (including a rectal exam to assess predisposition for colic), routine blood work (complete blood count [CBC]), serum chemistry profile, urinalysis), an electroretinogram, and ocular ultrasound. If the horse has historical or clinical evidence of recurrent uveitis, you should also submit serum and aqueous humor (collected at the time of surgery) leptospiral titers. Careful consideration should also be made of the horses’ AND owners’ temperament to determine if both can tolerate the long-term treatment and care that will be required after surgery.

Preoperative Preparation

Because of the concern for bacterial contamination and endophthalmitis after cataract surgery in horses, routine use of systemic and topical antibiotics is recommended. Also, we advise that if both eyes are candidates for cataract surgery, one should consider the pros and cons of the risk of bilateral endophthalmitis versus two anesthetics periods. We commonly recommend, therefore, that one eye be done at a time. Topical 4th generation fluoroquinolones (Moxifloxacin, Vigamox®, Alcon, Ft Worth, TX), which have been demonstrated to penetrate the intact cornea well and have a broad spectrum activity, are used for at least 24 hours prior to surgery and 3 days after surgery. A topical antibiotic is generally recommended for the length of time that the eye...
requires topical corticosteroid treatment. Intravenous antibiotics are generally also recommended for the 24-hour peri-surgical time period followed by 10-14 days of oral antibiotics. Topical atropine is used starting 12 to 18 hours prior to surgery. Systemic NSAIDS, preferably flunixin meglumine, is given starting at least 1 hour prior to surgery and continued in a decreasing dosage for up to 3 weeks after surgery. Gastric protectants, such as ranitidine and/or omeprazole (Gastrogard®, Merial) are routinely used to help prevent side effects. See Appendix A for the NCSU complete preoperative equine cataract medication protocol.

**Patient Positioning**

Correct positioning of the horse is critical for success for any type of intraocular surgery. For cataract surgery, the horse is placed in lateral recumbancy. The down eye is protected from pressure or exposure trauma, either by pillows or an inflatable ring. The horse’s nose is elevated using foam pillows so that the cornea of the eye to be operated on is parallel to the floor (Fig. 1). To prevent facial nerve paralysis after surgery, one must be careful that there is no pressure on the facial nerve from the halter (remove it), pillows, or tape. An operating microscope with coaxial illumination is essential to perform cataract surgery in the horse. Adequate visualization and lighting cannot be accomplished with any other system. The microscope base is placed opposite the surgeon, with the microscope arm extending over the horse’s body to position above the eye.

![Patient positioning – horizontal cornea.](image-url)

**Surgical Preparation**

After the horse is in a stable plane of general anesthesia, it should either be paralyzed or have had a retrobulbar block performed to prevent ocular movement and pressure on the eyes from tension of the extraocular muscles. Like all intraocular surgery, the horse and operating table should be covered with sterile drapes after surgical preparation. Adhesive, waterproof, aperture drapes are an effective barrier to contamination around the eyes. A lateral canthotomy may be required depending on the horse.
Surgical Approach

A 3-step, hinged corneal incision is recommended for the equine cataract surgery. A clear corneal approach is generally used for equine cataract surgery. Using a #64 microsurgical blade the right handed surgeon makes a 75-90% 5 mm long groove in the either dorsolateral (right eye) or dorsotemporal cornea (left eye), 1-2 mm from the limbus. The left-handed surgeon would use an opposite approach. The goal is to avoid the corpora nigra (Fig. 2).

Following the corneal groove, a 3.2 mm triangular blade is used to enter the eye. The equine iris is rarely completely dilated and the anterior chamber is relatively shallow. Therefore, inadvertent iris trauma is common and should be avoided as much as possible. This technique also results in a 2 step corneal wound that allows more accurate and watertight closure of the cornea. Aqueous humor should be collected prior to entering the eye (usually after the groove), but before use of the triangular blade. When removing the blade, this should be done slowly to again avoid iris trauma and to allow slow leakage of aqueous humor. Rapid release of aqueous humor, and its resultant rapid pressure drop, may cause the iris or ciliary body to hemorrhage. If hemorrhage occurs, either during iris trauma or rapid pressure drop, or if the pupil becomes miotic, use of approximately 0.5 ml of 1:10:000 epinephrine (diluted in BSS) injected intracamerally generally assist in minimizing the hemorrhage. If the iris appears to be in the path of the triangular blade during ocular entry, place a small bleb of viscoelastic (VE) to deepen the anterior chamber near the incision. Use of higher concentration hyaluronic acid VE (BioVisc®, AcriVet, Berlin) is particularly effective for this maneuver.

Capsulorhexis

In the new age of the routine use of equine IOLs, the perfect anterior capsulotomy is required. To perform a continuous tear capsulotomy (CCC), the anterior chamber is vaulted with VE and an incision is made in the peripheral lens capsule. How this incision is made is a personal preference. Some people like to make a radial incision using a 25 g needle or cystotome; others prefer to make a horizontal incision using a needle or blade (Fig. 3). The CCC can be started from this incision, or the incision can first be initiated, generally clockwise, using capsulorhexis scissors. Due to the large equine eye, shallow anterior chamber, and relatively small corneal incision, standard or elongated Utrata forceps are difficult to open and use. A much better
The instrument to use is the AcriVet equine capsulorhexis forceps (AcriVet, Berlin). Using this instrument, the standard CCC, using controlled shearing, but not uncontrolled ripping, of the capsule can be accomplished. Additionally, because of the size of the equine eye, a central CCC is difficult to accomplish using standard techniques. An easier, and more accurate method of equine CCC is using a radiofrequency CCC unit. This instrument eliminates the need to decide what type of initial incision is made and nearly always makes a perfect, central CCC. This perfectly central CCC eases IOL placement and allows a clear central visual axis postoperatively. Some surgeons prefer to do the CCC after PA of the lens. Although this may decrease some trauma to the corneal endothelium by keeping more lens fragments within the lens capsular bag, the risk for radial tears is high.

Phacoemulsification and Aspiration

Although PA can be accomplished successfully with a standard human or canine cataract system, use of a dedicated equine specific PA system (e.g., ALEXOS, AcriVet, Berlin, Germany) is highly recommended. The long needle, power, and irrigation and aspiration system designed for the horse eliminates the need to make multiple ocular incisions and allows the surgeon to be able to reach across the eye. Placement of long needles on standard PA hand pieces is also not recommended because microscopic cavitation bubbles that are commonly produced will be damaging to the eye.

Use of one or two-handed PA technique can be done depending on the density of the lens. If the horse is older than 8 to 10 years of age, I generally prepare to perform the PA technique two-handed. The posterior capsule in the horse is especially fragile, even in older horses; so much care is needed to prevent posterior capsular rupture. I prefer to perform all PA in the “zone of safety” in the anterior capsular bag. The “conquer and divide” PA method works well in horses and entails splitting the lens with a central groove, then splitting the halves and removing lens quadrants. Because of the large and deep equine lens, the surgeon should keep one foot on focus of the operating microscope, which generally needs frequent adjustments.

IOL Placement

Although the appropriate equine IOL power has yet to be determined, studies indicate that the correct IOL power will ultimately be approximately diopters. Use of the commercially available
18-diopter equine IOL for adult horses (AcriVet, Berlin, Germany) and a 14-diopter equine IOL for foals less than 6 month of age is recommended. Although these lenses may not have the correct power, horses that have received it have done well and have had excellent visual outcomes – far superior to eyes left aphakic.

To place the equine IOL, the lens capsular bag and anterior chamber are filled with viscoelastic. The cornea is opened along the original groove to a width of 5 mm using standard size right and left corneal section scissors. The IOL is folded in half with custom lens folding forceps and coated with VE. The leading haptic of the IOL is placed into the distal (dorso-lateral) lens capsular bag and the IOL forceps are removed leaving the IOL partially in the anterior chamber. The second IOL haptic is manipulated using a buttonhook lens manipulator so that the haptics are in the ventral medial capsule.

Surgical Closure

The cornea is closed with simple interrupted, simple continuous, or a shoelace continuous pattern of 7-0 to 8-0 absorbable suture, such as polyglatin 910 (Vicryl). The advantages of the shoelace continuous pattern include a lack of lateral wound shifting, a tight non-leaking incision, and a low incidence of dehiscence; therefore it is recommended over the other patterns. Removal of the VE by irrigation and aspiration is recommended prior to final tightening of the incision. Because of the high chance of inflammation, low incidence of postoperative pressure spikes, and lack of safety data, use of miocol or other intraocular miotic is not recommended in horses at this time.

If I am concerned about the integrity of the incision, I recommend placing a fornix base microhood conjunctival graft over the incision to further safeguard the eye for any type of dehiscence. The equine cornea commonly has mild to moderate corneal edema surrounding the incision, so the conjunctival graft makes me feel more confident of the incision. An incision through the conjunctiva is made at the limbus adjacent to the corneal wound. The conjunctiva is undermined and advanced over the incision. Generally 3-4 simple interrupted sutures of 7-0 to 8-0 vicryl are used to tack the conjunctiva in place.

To minimize ocular trauma on recovery, a lateral temporary tarsorrhaphy is performed. The suture is removed after the horse has recovered and is standing. Head protectants (hoods) and eyecups are not used because they may cause further trauma on recovery and should never be used after surgery in a horse not trained or used to wearing them. Frequent postoperative lubrication with a hyaluronic-based artificial tear (Blink®, CibaVision) is also done to minimize drying trauma.

Postoperative Considerations

Complications after equine cataract surgery seem to be higher than in canine surgery, but definitive studies have not been done. Common short-term (<14 days) ocular complications include uveitis, corneal edema, hyphema, corneal dehiscence, and retinal detachment. Long-term complications (>14 days) include glaucoma, uveitis, corneal edema, capsular fibrosis, retinal detachment). Most horses need medical therapy for up to 3 months, in decreasing frequency. Some horses require a baseline level of anti-inflammatory medications to keep the eyes quiet. We place a subpalpebral catheter (MILA) to ease the administration of medications post-operatively.
Colic, cecal impactions, colitis, and laminitis are common and sometimes fatal complications in hospitalized horses and seem particularly common after ophthalmic general anesthesia. Owners should be advised of these risks (including other anesthetic-related risks such as orthopedic injury) prior to surgery. Additional postoperative IV fluids (for up to 12 hours after surgery) may prevent colic, and careful monitoring of stool production, gut sounds, and digital pulses may catch the diseases in the early stages.

References