Corneal Transplants in the Horse

Sarah Czerwinski, DVM

Because of the horse’s prominent eye and outdoor environment, injuries to the eye are quite common. Prompt treatment is essential as these injuries can threaten a horse’s vision. Common ocular diseases secondary to trauma include corneal ulcers, corneal lacerations, corneal foreign bodies and corneal stromal abscesses. These diseases may be treated both medically and surgically. There are strong parallels between human and veterinary ophthalmology, yet many people are surprised to learn that corneal transplantation is a surgical therapy commonly performed in horses.

The Normal Cornea

The eye is a complicated organ with its own physiology, immune system, and wound healing. The cornea is the clear, outer part of the eye. It is clear because it lacks blood vessels and is essentially dehydrated. Because it does not have a blood supply, the cornea receives its nutrition from the tears and aqueous humor. In the horse the cornea is 1.0-1.5 mm thick in the center, and surprisingly tough.

The cornea contains several layers. The outer layer, the epithelium, is an important barrier to infection. The middle layer is the thickest and is called the stroma. There are specialized cells lining the inner part of the cornea that constantly pump water out of the stroma. The cornea appears cloudy when it contains excess water, and is no longer dehydrated.

Ocular Injuries

When the cornea is damaged the normal barrier is no longer intact, and bacteria and fungi are able to invade and set up an infection. An ulcer may initially be superficial, but infection can cause the ulcer to “melt”, and rapidly become deeper. Full thickness ulceration results in perforation of the eye and prolapse of the iris through the hole in the cornea.

Similarly, trauma to the cornea may also cause lacerations of varying depths. Any debris left within the cornea following a wound is a foreign body and acts as a source of infection and inflammation.

Stromal abscesses may form when bacteria or fungi enter the cornea through a small puncture wound or ulcer. The normal cells surrounding the defect slide in and seal the hole, trapping the organisms inside the cornea. The body’s reaction to the foreign material causes severe, damaging inflammation inside the eye.

Treatment

Corneal ulcers and stromal abscesses are often managed medically, with atropine, anti-inflammatory medications, and frequent application of topical antibiotic and antifungal medications. Deep or “melting” ulcers are often treated surgically. Lacerations typically require surgery, depending on the depth of the wound. Deep corneal wounds or ulcers are at risk of rupturing, which is a vision-threatening complication.
If the disease within the cornea is severe, surgery is often the preferred treatment option. Conjunctival flaps are commonly used as they act as a natural band-aid, providing structural support and quickly bringing a blood supply to heal the wound. The major downfall of conjunctival flaps is that they are not transparent, so the horse will lose vision in the area of the flap. This is of particular concern for large lesions in the center of the cornea.

**Corneal Transplantation**

Corneal transplants are another surgical treatment option for corneal disease. This procedure removes the diseased cornea and replaces it with normal cornea from a donor. The benefits include the reduction of pain and inflammation and faster healing, because the abnormal cornea is removed. Corneal transplants also provide structural support to compromised eyes that are at risk of rupturing.

There are 3 corneal transplantation techniques: penetrating keratoplasty (PK), deep endothelial lamellar keratoplasty (DLEK), and posterior lamellar keratoplasty (PLK). The technique chosen depends on the type of disease and the location of the lesion within the cornea. DLEK and PLK are similar techniques that are used for deep stromal abscesses as they preserve the superficial tissue, whereas PK is used for full thickness lesions such as deep or melting ulcers, lacerations, and abscesses involving the entire stroma.

The procedure involves removing a cylinder of diseased cornea using an instrument with a circular blade, similar to a biopsy punch. The missing piece of cornea is replaced with a circular piece of donor cornea. With DLEK and PLK the healthy, superficial, layer of cornea is lifted up and the diseased cornea underneath is removed and replaced. The top layer is then replaced and sutured down. PK involves removing and replacing a full thickness piece of cornea.

The donor cornea comes from horses with normal eyes that were humanely euthanized for other reasons. The cornea is treated with antibiotics and frozen until it is needed. It is then thawed and trimmed into the appropriate size to fill the wound. Fresh corneas may also be used.

**Complications**

Complications of corneal transplants include breakdown of the suture holding the graft to the recipient cornea (dehiscence) and infection inside the eye. This risk increases if the corneal tissue is already infected. This usually occurs at 5-10 days after surgery. The risk of developing an infection inside the eye post-operatively is small.

**Surgery at Rood & Riddle**

The consulting ophthalmologist at Rood & Riddle Equine Hospital, Dr. Claire Latimer, performs corneal transplant surgeries. Corneal transplants are a useful tool for maintaining the vision of horses with certain types of ocular disease including stromal abscesses, deep corneal ulcers and corneal lacerations. There are also non-traumatic indications for corneal transplantation; however these diseases are relatively uncommon.