Booney's Bothersome Blepharospasm

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Introduction

A corneal stromal abscess is caused by trauma to the corneal epithelium, which usually occurs from penetrating wounds, foreign bodies, or incomplete resolution of ulcers[2]. When the trauma occurs, the stroma is exposed to a bacterial or fungal micro-organism that originates from the foreign object or the normal flora of the horse[1]. There is an increased incidence of stromal abscesses in horses that live in temperate climates due to the perfect conditions for growth of the organism[6]. The abscesses can appear as a yellow or white focal corneal opacity, diffuse yellow/ white corneal opacity, or pink focal corneal opacity[3]. They are exceedingly difficult to treat and may result in uveitis or cataracts, and eventually blindness. They are commonly treated with medical therapy or surgery[1,2].

History and Presentation

Booney, a 15-year-old gelding Quarter horse, presented to Mississippi State University College of Veterinary Medicine Equine and Ophthalmology Services on October 22nd, 2020 for cloudiness of his right eye. His owners noted blepharospasm, epiphora, and a cloudy spot on his cornea one week prior to presentation. They took him to their rDVM who treated the eye with ofloxacin. The owners were unable to administer the antibiotic regularly due to Booney's lack of compliance. There was no improvement with the antibiotic and the eye was still painful, so he was referred to MSU-CVM for further diagnostics.

On presentation, Booney was bright and alert for his physical exam. He weighed 531 kg (1,168lbs) and had a normal body condition. His hydration appeared within normal limits and his mucus membranes were pink with a capillary refill time less than two seconds. His vital parameters were also within normal limits with a heart rate of 44 beats per minute, respiratory

rate of 28 breaths per minute, and a temperature of 101F. There were no abnormalities noted on cardiopulmonary auscultation. Gut sounds were normal in all four quadrants. All four of his hooves were moderately overgrown. His right eye had a focal area of cloudiness deep within the stroma. Blepharospasm and epiphora were also noted in his right eye.

Diagnostic Approach

An ophthalmic examination was performed to further evaluate the opacity seen in Booney's eye. His menace and dazzle reflexes were intact in both eyes. The left pupil was within normal limits, but the right pupil was miotic. The right pupil had a negative direct pupillary light reflex (PLR). The consensual PLR from left to right was negative and the consensual PLR from right to left was positive. He was then sedated with 5mg of detomidine and 5mg of butorphanol along with auriculopalpebral and suborbital nerve blocks with 1ml of carbocaine. The cornea was also numbed with proparacaine for a full ophthalmic examination. The left globe had a normal size, position, motility, palpebral reflex, and comfort. Enophthalmos and blepharospasm were seen in the right eye, but it had normal position, motility, and palpebral reflex. The nictitating membranes were normal in both eyes, but the right eye had 2+ hyperemia of the conjunctiva. There was no fluorescein stain uptake in either eye. The intraocular pressure was 12mmHg in the right eye and 18mmHg in the left eye. The cornea of the right eye had edema and an epithelial scar toward the center of the eye. A deep stromal abscess was visualized in the center of the eye with vascularization of the cornea ventrally. The left anterior chamber was within normal limits and no cells or flare were visualized. In the right eye, no hypopyon or fibrin were seen, but there was 1+ flare and 1+ cells seen. The lens, vitreous, and fundus were not visible in the right eye, but normal in the left eye.

Since there was no fluorescein uptake in either eye, this indicated that the lipophilic epithelium was still intact and there was no exposure of the stroma. This proves that the lesion was not an ulcer, but a deeper abscess that the epithelium had healed over. The supporting clinical evidence, which included corneal edema surrounding the opacity, miosis, and hyphema, all supported the clinical diagnosis of stromal abscess.

Because the cornea was intact, samples could not be obtained during initial examination. Thus, cultures and biopsies were later submitted after surgery.

Pathophysiology

There are many different hypotheses for pathogenesis of stromal abscesses in horses. The most accepted theory is micro-organisms are introduced into the eye through damage to the cornea; however, some studies describe that deep stromal abscess occur via posterior migration of fungi from the superficial cornea to the deeper cornea or spread from systemic infections[3]. This theory is plausible based on the occurrence of multiple abscesses in a single eye or bilateral abscesses.[3,5]. Stromal abscesses commonly arise from fungal infections, rather than bacterial because epithelial cells are more likely to reepithelialize over fungi[5,3]. The most common fungal pathogens seen are Aspergillus and Fusarium because they are normal inhabitants of the equine eye[2].

The normal equine cornea is a transparent structure that has special immune privilege, which allows it to avoid massive attraction of leukocytes and ultimately avoid vascularization and fibrosis[5]. However, when an organism is introduced into the cornea, this causes the innate defenses to be down regulated and then allows stromal inflammatory disease to occur[5]. This occurs by the induction of neutrophils and macrophages in the tear film which up regulate

cytokines, particularly interleukin 1, which in turn induces matrix metalloproteinase, inflammation, and degeneration. The stroma becomes abscessed when the corneal epithelium repairs and the inflammation is walled off[5].

The formation of stromal abscesses occurs in three different stages. In the first stage, the organism triggers corneal inflammation by the induction of neutrophils and macrophages. At this point, there is generalized inflammation that appears to be like uveitis and vascularization slowly starts to be present at the limbus[6]. In the second stage, vascularization is progressing, but is still distant from the site of the abscess. At this stage, the inflammation and cellular infiltrates will begin to consolidate into a smaller more focal area. Then in the third stage, there will be vascularization around the site of the abscess but does not directly invade the area[6]. The vascularization does not occur directly at the site of the abscess due to fungal or bacterial secretion of anti-angiogenic factors[6].

Treatment and Management Options

There are two main standards of care when treating these kinds of abscesses which include surgery with medical therapy or medical therapy alone[2]. Medical treatment of superficial stromal abscess can have good results; but in contrast, deep stromal abscesses usually are unresponsive to medical therapy[5]. This is due to re-epithelialization that interferes with the penetration of the topical medications[5]. The goals of treatment are to minimize damage to the cornea, control MMP expression, reduce inflammation, maintain blood ocular barrier, control pain, and most importantly maintain vision[7].

Common medical treatments include serum, topical atropine, antibiotics, antifungals, and systemic NSAIDS[2]. Serum is used to inhibit proteases and can reduce MMP by 80% in 4-7

days[7]. Topical atropine is used to reduce protein leakage, synechia formation, and pain. Antibiotics should be used as a combination and based off the status of the cornea. While all of the antibiotics listed can be used, some are more useful when the cornea is intact. If the cornea is not intact, triple antibiotic (bacitracin, neomycin, polymyxin B) or aminoglycosides (gentamicin, tobramycin) are the best options[7]. If the cornea is intact fluoroquinolones (ciprofloxacin, ofloxacin, moxifloxacin), cephalosporins (cefazolin), or chloramphenicol are the best choices[7]. Specific antifungals should be used which include voriconazole, natamycin, and miconazole[7]. Systemic NSAIDS are also useful because they have anti-prostaglandin activity and should be given on the higher end of the dose to control pain. Furthermore, steroids are contraindicated when treating this condition because they will delay corneal healing and cause keratomalacia[7,8].

For the more severe cases of stromal abscesses, surgery should always be considered. There are various surgical procedures that can be performed, some of the most common are keratectomy, posterior lamellar keratoplasty (PLK) (along with other keratoplasties) combined with conjunctival flap, and intrastromal antifungal injections[7]. The gold standard for deep stromal abscesses that are in the central cornea is posterior lamellar keratoplasty[3,6].

Booney's owners elected posterior lamellar keratoplasty based on the surgeon's recommendations after finding a deep corneal abscess in the central cornea. He was started on medical therapy on the day of presentation. A catheter system was threaded through the upper eyelid with a large bore catheter and anchored in place by a footplate in the conjunctival fornix, this is referred to as a subpalpebral lavage system (SPL). The catheter tubing was then secured on the rostral aspect of the head with skin sutures. Several medications were then administered in liquid form through the system to cover the entire cornea. The day before surgery he was given

0.1mls of ofloxacin and voriconazole in the right eye through the SPL every 4 hours. Also, 1.1mg/kg of Banamine was given intravenously every 12 hours.

The next morning (10/23/20) the posterior lamellar keratoplasty procedure was performed. The patient was placed under general anesthesia and placed in left lateral recumbency. The right eye and eyelids were clipped and prepared routinely with a 1:50 solution of betadine. The eye was draped, and an eyelid speculum was placed to open the lids. The stromal abscess was measured with Jameson calipers and was 6x6mm initially. Using a 64 Beaver blade, a three-sided rectangular incision, that was 1/3-2/3 stromal thickness, was made into the cornea over the stromal abscess, approximately 10 mm wide (~2-3 mm on either side of the abscess). The fourth side of the rectangle was left uncut as a hinge (this part was temporal), and the flap was undermined with a 64 Beaver blade to make a flap overlying the abscess. The abscess was measured again and was found to be 5x5mm. A 6mm biopsy punch was used to outline the abscess to the depth of Descemet's membrane around the stromal abscess. The biopsy punch went full thickness in one area, so this was used as the entry into the anterior chamber. Viscoelastic was used to maintain the anterior chamber throughout the procedure. Right and left corneal section scissors were used to remove the affected corneal tissue (abscess). The tissue was cut in half and submitted for culture and histopathology. A 6 mm disc of donor cornea (epithelium removed) was placed and sutured using 8-0 Vicryl in a simple interrupted pattern into the defect. Hyphema and fibrin were noted coming from the corpora nigra during the procedure. Additionally, the stroma associated with the flap was markedly edematous. The corneal flap was laid over the defect and was closed with 8-0 Vicryl in a simple interrupted pattern. A lateral temporary tarsorrhaphy was placed at the end of surgery. The patient recovered without complication.

After surgery, Booney was given Banamine (flunixin meglumine) 1.1mg/kg intravenously every 12 hours, 0.1mls of atropine was also given through his SPL every 8 hours, 0.1mls of ofloxacin, voriconazole, and serum were given through his SPL every 4 hours. A Equivizor was placed over his eyes so he would not be able to rub his head and cause damage to his surgery site.

Case Outcome

An ophthalmic exam was performed one day post-op (10/24/20) to assess progress after surgery. The right eye had no menace but still had a dazzle reflex. Enophthalmos and blepharospasm were still seen. The tarsorrhaphy was in place, but slightly loose. The sutures from the surgery site were still intact, but the cornea was edematous and was slightly bulging out. There was one loose suture on the medial aspect of the graft. There was no leaking at the surgery site, which was proven with a negative fluorescein stain and Seidel test. The dorsal aspect of the pupil and optic nerve were visualized; however, the rest of the pupil was unable to be visualized due to hyphema and fibrin clots in the anterior chamber. A direct or consensual PLR were unable to be visualized. He was continued on all the same medications that he received after surgery.

Four days post op (10/27/20), there was a menace response, and the globe was less blepharospastic. The sutures were still intact with a negative fluorescein and Seidel tests. The whole pupil was visualized and appeared slightly dilated. There was still no direct or consensual PLRs due to the atropine administration. Trace flare was still present, but the hyphema and fibrin were reduced. He was continued on the same medications he received after surgery, but Gastrogaurd was also added to his treatments and he received ¼ a syringe every 24 hours.

Seven days post op (10/30/21), Booney was sedated with 5mg of detomidine and 5mg of butorphanol along with auriculopalpebral and suborbital nerve blocks with 1ml of carbocaine. The cornea was also numbed with proparacaine for a full ophthalmic examination. The eye was still mildly blepharospastic and the tarsorrhaphy was removed. The stroma was bulging at the surgery site, and there was an area dorsal to the surgery site that was positive on fluorescein stain. The stromal flap was removed at the dorsal edge of the graft and a 7-0 suture was placed. The pupil was dilated, and the fibrin and hyphema continued to resolve, but there was a trace amount of fibrin and blood in the anterior chamber.

The results from his biopsy and cultures came back from the clinical pathologist and revealed no aerobic or anerobic growth at 24-or 48 hours, but the fungal culture was still pending. The histopathology diagnosis of the cornea was confirmed as necrosuppurative, subacute, focal, severe keratitis with stromal edema and loss and intralesional fungal hyphae within the stroma. This histopathology report indicated that the stromal abscess was of fungal origin therefore, Booney's treatment should be focused on antifungal medications**.** At this time, the 0.1mls of ofloxacin through his SPL was decreased to every 6 hours and the 0.1mls of atropine through his SPL was decreased to every 24 hours. The serum was also discontinued at this time. The Banamine, voriconazole, and Gastrogaurd were continued at the same dose and interval.

Twelve days post op (11/4/20), vision was normal in the right eye and still mildly blepharospastic. There was still edema seen around the surgery site, but there was more vascularization. Trace flare was still present, and pigment was visualized on the anterior lens. At this time, the 0.1mls of ofloxacin through his SPL was decreased to every 8 hours and the 0.1mls

of voriconazole through his SPL was decreased to every 6 hours. The atropine, Banamine, and Gastrogaurd were continued at the same dose and interval.

Booney was discharged on November 7th, 2020. He was sent home with oral Banamine 50mg/ml given orally every 24 hours for 7 days and Gastrogaurd ¼ tube orally every 24 hours for 12 days. In addition, he was sent home with his SPL still in place for topical medications to be given by the owners. His owners were instructed to give atropine 0.1mls every 48 hours until his next recheck, voriconazole 0.1mls through the SPL every 6 hours, and ofloxacin 0.1mls through the SPL every 8 hours.

Booney presented for a 2 week recheck on November 19th, 2020. His owner reported that he still had intermittent ocular discharge and could not hold his eye fully open; however, it had improved since initial presentation. He only wore his Equivizor when he was traveling due to the irritation it caused under his eyes. Otherwise, he had been doing well on stall rest. On ophthalmic exam, the right eye was fluorescein stain negative, and the surgery site and abscess had healed based off slit lamp biomicroscopy. At this point, the fungal cultures were finally back and there was no growth after 3 weeks at the laboratory. The therapeutic plan was changed by discontinuing Banamine and Gastrogaurd. The 0.1mls of voriconazole and ofloxacin were decreased to every 12 hours through the SPL; however, the atropine was continued at the same dose and interval.

Booney presented for his final recheck on December 1st, 2020. His owners had run out of eye drops one week before the recheck, so he had not received any medications for one week prior to his visit. They reported that his right eye had been comfortable and only had minimal tearing. On ophthalmic exam, he had normal vision and no blepharospasm was noted. The cornea was fluorescein negative and there were areas of fibrosis and vascularization seen around

the surgery site. The pupil size was midrange and had an incomplete direct PLR. There was no flare present in the anterior chamber, and some pigment was seen in the center of the lens. All other exam parameters were within normal limits. The SPL was then pulled and cleaned with betadine. There were no further medications required or rechecks needed.

Conclusion

This case highlights the intensive treatments required for deep stromal abscesses. To have the best chance of the patient regaining vision, the owner must be committed to long term treatment, including, medical therapy and surgery. After surgery, these horses usually stay in hospital up to three weeks and then require two weeks of medical therapy at home. Despite the most intensive treatments, the horse could still develop uveitis and cataracts, which can eventually lead to blindness; thus, ending the career of a performance horse. Unfortunately, there are still many unanswered questions about this condition and further studies are needed to investigate why this disease is more common in horses than other species.

References:

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