Sammy's Got an Eye on You
Standing enucleation and retrobulbar abscessation

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Introduction

Retrobulbar abscessation is a rare cause of orbital disease in the horse, and in many cases, the definitive cause of orbital inflammation cannot be determined.[8] The globe can be subject to trauma, inflammation, neoplasia, and congenital diseases, which can ultimately involve structures adjacent to the orbit.[4] Conversely, diseases originating from adjacent structures, such as the sinuses, may extend into the orbit.[4] Treatment selection depends on the etiology and chronicity of the disease process, health status and intended use of the horse, and owner finances, and may range from medical management to surgical intervention. In severe cases, a diseased eye can be effectively enucleated, using a transpalpebral approach, with the horse sedated in a standing position. [7]

History and Presentation

On January 11th, 2021, a 43-year-old American Quarter Horse gelding by the name of "Do It Right Sam" (AKA "Sam") was referred to the MSU-CVM Equine Emergency service for evaluation of a swollen right eye. His primary veterinarian had attempted to conservatively treat Sam's lesions and prior to referral, treatment with intramuscular ceftiofur (Excede) was also started. The cause of the swelling was unknown; however, the condition was first noticed by his owners on Monday, a week prior to presentation. Furthermore, approximately 6 months prior to the incident, Sam was diagnosed with Pituitary Pars Intermedia Dysfunction by his primary veterinarian and was prescribed Pergolide (Prascend) to treat his condition.

On presentation, Sam had severe exophthalmos of his right eye in conjunction with periorbital edema and mucopurulent ocular discharge, as well as mild purulent nasal discharge.

Sam arrived at the animal hospital violently throwing his head, which can be interpreted as a sign of severe pain. He was also sweating profusely over his neck and dorsum. Upon cardiovascular

auscultation, he had an elevated heart rate of 68 beats per minute and a grade IV out of VI diastolic murmur with a point of maximal intensity over the aortic valve. Decreased gastrointestinal motility was noted in the upper quadrants when compared to the lower quadrants. Additionally, digital pulses were slightly pronounced on the right forelimb. It was determined that given the severity of his lesions an enucleation would be the best treatment since the eye was no longer functional, to relieve inflammation and provide patient comfort.

Diagnostic Approach

Ophthalmic examination

On evaluation, Sam had marked facial asymmetry due to severe exophthalmos and marked periocular edema. The conjunctiva surrounding the eyelid margins was severely edematous and protruded from the palpebral fissure. A focal, sharply demarcated area of hyperemia was present on the lateral aspect of the inferior eyelid. Additionally, there was a copious amount of purulent exudate observed on the surface of the globe. The skin over the right eyelid and frontal sinus was severely irritated with discolored coalescing areas of alopecia and ecchymosis that were dark red to dark purple.

Blood Work

On the day of Sam's arrival, a sample of blood was collected to perform a complete blood count and a blood chemistry panel. The complete blood count showed moderate hyperfibrinogenemia of 700 mg/dl (reference range(rr): 100-500 mg/dl), and a moderately mature neutrophilia 13671.2 cells/ul (rr: 2500-6000 cells/ul), which were consistent with the inflammation occurring in response to his wounds. The chemistry panel revealed a moderate elevation of glucose of 189 mg/dl (rr: 60-122 mg/dl) and a moderate increase in the liver enzyme alkaline phosphatase of 246 U/L (rr:61-153 U/L), consistent with his previous diagnosis of Pituitary Pars Intermedia

Dysfunction. The test also revealed a mild hyperglobulinemia of 5.1 g/dl (rr:2.5-4.0 g/dl), consistent with an inflammatory process. Additionally, a mild hypoalbuminemia of 2.7 g/dl (rr: 2.8-3.9 g/dl) and mild polycythemia of 14.86 10^3/uL (rr: 5.0-11.90 10^3/uL) were also evident. Blood work was repeated on January 18th, and although the values remained similar, the hyperfibrinogenemia had improved (500 mg/dL).

Histopathology

On January 13th, 2021, following Sam's enucleation (discussed in detail in the treatment section below), the globe and periocular tissues were submitted in formalin for examination via biopsy. According to the biopsy report, most of the conjunctiva, sclera and cornea were replaced by immature and mature granulation tissue, in addition to focal areas of necrosis of the sebaceous glands. The histopathology report concluded that the most significant findings were present in the periocular tissues, as much of the conjunctiva and periorbital connective tissues, as well as the sclera of the globe were infiltrated by abundant necrosuppurative and granulomatous inflammation. Nonetheless, the optic nerve remained unaffected.

Microbial Culture and Sensitivity Testing

On the day of surgery, a sample of purulent exudate from the inside of the wound that communicated with the orbit was submitted for an aerobic culture and sensitivity (C&S) to guide the selection of the most effective antibiotic. The results of the C&S revealed growth of *Streptococcus sp*. organisms that were susceptible to a variety of antibiotics including cefazolin.

Treatment

Given the painful nature of Sam's lesions, intravenous administration of flunixin meglumine (Banamine) at 1.1 mg/kg began shortly following his arrival to the hospital and surgical intervention was elected. Considering that Sam's lesions had an infectious etiology, once

a day intravenous administration of gentamicin at 6.6 mg/kg was started until the C&S test results were available. He had already received a dose of ceftiofur (Excede) intramuscularly by the rDVM three days prior to presentation. Once the results of the C&S were available, intravenous administration of cefazolin at 11 mg/kg every eight hours was added to his treatment regimen. Sam's creatinine was closely monitored through the period when he was receiving gentamicin and flunixin meglumine as these can have a cumulative nephrotoxic effect.

On January 12th of 2021, Sam was prepared for surgery. He was placed in the stocks for restraint and an intravenous catheter was placed to facilitate administration of medications. He was administered flunixin meglumine at 1.1 mg/kg intravenously and gentamicin at 6.6 mg/kg intravenously once and was maintained on a continuous rate infusion of butorphanol and detomidine diluted in sodium chloride for the duration of surgery.

Transpalpebral Standing enucleation

A sterile preparation of the surgical site was performed with a 1:50 betadine solution and sterile water on the left periocular and ocular surfaces. Chlorhexidine was used to scrub the left supraorbital fossa for 5 minutes ensuring no scrub entered the eye. A sterile scrub with 1:50 betadine and saline was performed using cotton balls and sterile Q-tips were used for application. A sterile towel drape was placed over the face ventral to the eye and was secured with 4 towel clamps to the clean halter.

Akinesia of the eyelid was achieved by performing an auriculopalpebral nerve block, which can be palpated over the zygomatic arch. The nerve block was performed with 1-2 ml of bupivacaine 0.5% using a 25-gauge needle. Desensitization of the eyelid was performed using supraorbital, lacrimal, infratrochlear and zygomatic blocks. The frontal nerve was blocked by injecting 1-2 ml of bupivacaine 0.5% at the level of the supraorbital foramen. At the level of the lateral canthus,

the lacrimal nerve was blocked by subcutaneous administration of approximately 1 ml of bupivacaine. The infratrochlear nerve was desensitized at the level of the medial canthus, and zygomatic nerve desensitization was performed as a line block at the level of the ventral orbital rim. A 4-point retrobulbar block was performed with 18 mL bupivacaine along the dorsal, medial, ventral, and lateral aspects of the right orbital rim to desensitize the globe and conjunctiva. Topical proparacaine was used to desensitize the cornea.

The eyelids were sutured together using a simple continuous pattern, and a towel clamp was placed for handling purposes during dissection. An incision parallel to the eyelid margin was made approximately 5 mm from the margins and joined at the point of the medial and lateral canthi. Subcutaneous dissection was achieved using Metzenbaum scissors, taking care not to puncture the conjunctival sac. A moderate amount of purulent material was encountered in the dorsal aspect of the orbit during dissection. The medial and lateral canthi were transected using a #10 scalpel blade and transection of the ocular muscles was achieved by alternating between the scalpel blade and curved Mayo scissors. Throughout the dissection process marked amounts of purulent exudate drained from the orbit. Once dissection was complete, the optic nerve was transected using mayo scissors and the globe was extracted. The orbit was copiously lavaged using sterile saline and debrided using 4x4 gauze.

The swollen area over the supraorbital fossa was evaluated for suspected abscessation using an ultrasound, which showed a pocket of hypoechoic fluid intermixed with flocculent hyperechoic material. A local block was performed over this region using approximately 1 ml of lidocaine followed by aspiration of purulent material using an 18g needle and a 3 ml syringe. Once the abscess was confirmed, a stab incision over the temporal region with a #10 scalpel blade was performed which resulted in a copious amount of purulent exudate drainage. This pocket could

be followed from the abscess covering the dorsal frontal sinus to the supraorbital fossa and finally into the orbit. The abscess was allowed to drain and was thoroughly lavaged using sterile saline. Kerlix rolled gauze was used to debride the abscess cavity.

On palpation of the orbit, an irregular step defect could be felt in the bone on the dorsal rostral aspect of the orbit near the medial canthus. The wounds and the orbit were then packed using Kerlix rolled gauze and nitrofurazone ointment and left open to heal by second intention due to the infection and to allow for drainage and continued wound management.

Following the enucleation, a standing sinoscopy via trephination of the frontal sinus was performed to allow visual evaluation and facilitate proper drainage of the sinuses. The entrance site for trephination was positioned 0.5 cm caudal to a line drawn between the left and right medial canthi, and halfway between the midline and the ipsilateral medial canthus. [(1)] The skin over this area was clipped and aseptically prepared, and 2 mL of 2% lidocaine was infiltrated subcutaneously at the site. An approximately 2 cm semilunar incision was made in the skin and care was taken to also incise the underlying periosteum. Sam's frontal bone was trephined using a Galt trephine and a flexible endoscope was introduced through the incision and used to visualize the rostral maxillary sinus and ventral conchal bulla. Immediately upon perforation of the frontal bone, abundant purulent material began to drain from the sinuses. The sinuses were lavaged with 3 to 4 liters of sterile saline until the fluid drained through the nasal cavity. Finally, the skin was apposed using staples to allow for easy access to the sinus for further lavage in the following days. A figure-of-eight bandage was created using 3-inch Elastikon taking care not to wrap too tightly around the throat and avoiding rubbing the opposite eye. A bandage change was performed one day post-operation and a sinus lavage was performed two days after the enucleation surgery.

Pathophysiology

Due to the chronic nature of Sam's lesion, and considering his clinical presentation, it was clear that Sam was suffering from an infectious lesion. It was determined that Sam had developed a retrobulbar abscess. Possible causes include, but are not limited to, ocular trauma, extension of sinusitis into the orbit, inoculation of bacteria by foreign material, foreign body, and orbital cellulitis.

During a direct traumatic event to the eye, the dorsal orbital rim and zygomatic arch are at greatest risk of fracture because of their prominent location in the skull of the horse. Facial trauma can also result in orbital injury, most commonly from lateral blunt impact. [(4)] It is possible that Sam had suffered from a traumatic event over his zygomatic arch that led to the infection of the orbit which then progressed into the frontal sinus.

On the other hand, sinus diseases have the potential to extend and cause damage to the orbit. Sinusitis is one of the most common non-neoplastic diseases of the equine head with clinical signs that include unilateral nasal discharge, facial swelling, decreased nasal airflow and the possibility of exophthalmos.[(4)] The most common bacterial isolates in cases of primary sinusitis are *Streptococcus equi* and *Streptococcus zooepidemicus*, whereas culture of secondary sinusitis samples generally yields a mixed bacterial population, including anaerobes.[(5)] In Sam's case, the retrobulbar abscess could have developed as a complication due to *Streptococcus spp.* frontal sinusitis.

Perforation by a foreign body, direct trauma and seeding by septic emboli are among the more common causes of orbital cellulitis. [(4)] For instance, Sam's eye could have been inoculated by a small particle, such as foxtail grass, that initiated local inflammation and infection of the orbit which progressed into the periocular tissues and the frontal sinus.

Case Outcome

Post-operatively, Sam was placed on intravenous isotonic crystalloid fluids supplemented with calcium gluconate and magnesium sulfate at a rate ranging from 1-2 L/hour from January 16th until the 19th, 2021. Administration of flunixin meglumine at 1.1 mg/kg intravenously was continued every 12 hours for eleven days post-operation and every 24 hours until the day of discharge. Over the course of his hospitalization, Sam developed antibiotic-induced colitis which was treated with misoprostol at 5 mg/kg and Platinum Balance probiotic paste orally every 12 hours, and one scoop of Biosponge digestive supplement by mouth every 4 hours. Sam received bandage changes every three to four days and sinus lavages were performed at two, nine, and seventeen days post-surgery.

After 21 days of hospitalization, Sam was discharged from MSU-CVM Equine Medicine and Surgery service with detailed instructions in regards to his care. He was discharged on oral medications which included flunixin meglumine at 1.1 mg/kg once a day, misoprostol at 5 mcg/kg twice daily, chloramphenicol at 50 mg/kg every 8 hours, and two scoops of Platinum Balance twice daily. Cephapirin sodium ointment was also prescribed for application unto the wound area and inside the orbit. Sam's bandage was to be changed weekly or as needed by his primary veterinarian, and his wounds were to be assessed for proper healing. One month post-operatively, Sam's wounds were healed. Around this time, Sam had an acute onset of neurological signs and was seen by a different veterinarian who prescribed a course of corticosteroids which improved his condition.

Discussion and Conclusion

Retrobulbar abscessation in the horse is rare and clinical signs include periorbital swelling, exophthalmos, chemosis, blepharoedema, purulent ocular discharge and

blepharoconjunctivitis.[9] Diagnosis of retrobulbar conditions in the horse can be aided by ultrasonography, computed tomography or magnetic resonance imaging. [9] Although an uncommon condition, it should be maintained as a possible diagnosis of orbital disease that is often unresponsive to conservative treatment.

Enucleation is indicated for the removal of a painful, blind, deformed, or traumatized eye or when extensive neoplasia or infection has rendered survival of the globe unlikely or would require unreasonable duress for the patient.[4] Before determining if enucleation is the best treatment choice for any horse, factors such as the intended and alternative use of the horse, sport discipline regulations, cosmetics, and the economic impact of the surgery must be considered.[3] In regards to Sam, enucleation of the eye was the preferred treatment option since the eye was nonfunctional, severely painful and inflamed, and the owners did not have cosmetic concerns. When deciding whether a procedure should be performed standing or under general anesthesia, aspects such as the patient's concurrent health conditions, anesthetic risk, complications associated with the procedure and expenses should be considered. Performing a standing enucleation can be a viable option for patients that are poor anesthetic candidates [3], as often, a deep plane of anesthesia is required, with potential for hypotension and hypoventilation, leading to further complications such as myopathies and prolonged or traumatic recoveries from anesthesia. [6] Given Sam's age and potential for cardiovascular complications due to his heart murmur, a standing procedure was elected. Furthermore, a standing enucleation can reduce the cost of the surgery in addition to allowing for a more comfortable position for the surgeon to perform the enucleation. [3] Currently, two techniques have been described, transpalpebral and subconjunctival enucleations.

As described by Brooks, D. E. (2006) during a transpalpebral approach, the eyelids are sutured together and dissection into the orbit is made external to the extraocular muscles.[2] This method is useful to prevent further contamination in cases of severe ocular infections, as well as for wide resection of orbital neoplasia that has invaded the periocular tissues.[3] In contrast, the subconjunctival approach is done by performing a limbal periotomy and is generally used when a cosmetic shell is to be placed to maintain the integrity of the lid margin.[2] Post-operative care of the surgical site, appropriate pain management and selection of proper antibiotics are crucial to promote a successful outcome.

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