History

An approximately 21-year-old 393-kg female mixed-breed horse was presented for a 3-week history of increased ocular opacity and swelling associated with the left eye that was slowly and progressively worsening. There was no known traumatic event or prior historical ocular issues. The horse was acquired approximately 12 years prior to presentation and relevant clinical history included a diagnosis of equine protozoal myeloencephalitis (EPM) approximately 10 years prior to presentation that the mare recovered from with a slight persistent ataxia. The patient was subsequently retired to a pasture setting.

Upon presentation to the primary veterinarian, the patient was administered flunixin meglumine at an unknown dose 5 days prior to presentation to the referral hospital.

At the referral hospital, a physical examination revealed clinically normal vital signs. A neurologic examination was performed that showed slight intermittent weakness and ataxia in the hindlimbs that was attributed to the historical diagnosis of EPM. An ophthalmologic examination was performed (Table 1).

Table 1—Summary of ophthalmic findings on presentation of a 21-year-old xx-kg female mixed-breed horse evaluated for a 3-week history of increased ocular opacity and swelling associated with the left eye that was slowly and progressively worsening.

<table>
<thead>
<tr>
<th>Eye</th>
<th>Vision</th>
<th>Cornea</th>
<th>Pupil</th>
<th>Intraocular pressure (mm Hg)</th>
<th>Pupillary light reflex</th>
<th>Anterior chamber</th>
<th>Indirect ophthalmoscopy fundic examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>23</td>
<td>Normal</td>
<td>Normal evaluation</td>
<td>Unable to visualize</td>
</tr>
<tr>
<td>OS</td>
<td>Absent menace</td>
<td>Diffuse (3+)</td>
<td>Normal</td>
<td>14</td>
<td>Normal Limited evaluation, but no aqueous flare noted</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>corneal edema</td>
<td>Positive fluorescein stain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Formulate differential diagnoses, then continue reading.

Diagnostic Imaging

Findings and Interpretation

Based on the ophthalmologic examination, the patient was diagnosed with diffuse corneal edema with secondary corneal ulcerations from corneal bulla rupture and secondary reflex uveitis from the corneal ulcerations causing hypotony (decreased intraocular pressure).

Because evaluation of the left eye was unable to be fully performed due to severe corneal edema, ocular ultrasonography was performed (Figure 1).

Figure 1—Ultrasonographic images of the left eye (A) and a close-up image of the iridocorneal angle of the same eye (B) of an approximately 21-year-old xx-kg female mixed-breed horse evaluated for a 3-week history of increased ocular opacity and swelling associated with the left eye that was slowly and progressively worsening.

Keywords: equine, Descemet, ocular, eye, ultrasound
made to the right eye which was normal on ophthalmologic examination. In the left eye, the cornea was subjectively thickened, but measured within clinically normal limits (0.23 cm [reference range, 0.15 cm to 0.37 cm])1; however, it was diffusely hyper-echoic. Within the anterior chamber of the left eye, a thin, smoothly marginated, curvilinear, hyperechoic band was seen spanning from the medial and lateral corneal angles that was not adhered to the cornea. Bilaterally, there were a few hyperechoic foci within the vitreous humor. Additionally, there were hyperechoic foci within the central and peripheral portions of the lens bilaterally. The rest of the findings on ultrasonography were unremarkable, and there were no ultrasonographic findings consistent with retinal detachment (Figure 2).

Based on these findings the patient was diagnosed with Descemet membrane detachment (DMD) of the left eye with corneal edema. Additionally, there was bilateral asteroid hyalosis and mild cataract formation present.

Treatment and Outcome

The patient was confined to a stall or small paddock for close observation until a recheck examination at 1.5 weeks. In addition, the following treatments were initiated: 5% sodium chloride hypertonicity ophthalmic ointment (Muro 128; Bausch & Lomb; OS, q 8 h), neomycin–polymyxin B sulfates–bacitracin zinc ophthalmic ointment, (OS, q 8 h), and flunixin meglumine paste (Banamine; Merck & Co, Inc; 400 mg, PO, q 24 h) until recheck examination 1.5 weeks later.

The recheck examination was performed by the primary veterinarian, and the status of the left eye at that time was not provided. The patient represented 6 months later to the referral hospital for persistence of the corneal edema with intermittent pain described as rapid blinking and partial closure, with presence of ocular discharge. On recheck examination, the mare showed signs of persistent pain associated with the left eye, which also had a corneal ulcer, corneal edema, and persistent DMD on ultrasonography. Surgical consult options such as a Gundersen inlay conjunctival flap or thermokeratoplasty were discussed, but the owner elected enucleation due to financial constraints. Enucleation via a subconjunctival technique was performed. The left eye was removed fully and submitted for histopathologic evaluation.

The histopathologic diagnosis was consistent with corneal ulcer with corneal edema and neovascularization. Descemet membrane was noted to be detached and fragmented; however, because Descemet membrane can become artifactually detached during the slide preparation process for histology, it can be difficult for pathologists to determine if the detachment occurred antemortem or is artifact. Thus, antemortem ocular ultrasonography in this case was critical in assisting confirmation of DMD.

Comments

In this case, the persistent corneal ulcer, corneal edema, and financial constraint led to the enucleation of the globe. The DMD likely added to the persistent corneal edema and clinical signs. In horses with non-painful corneal edema and DMD, surgical or medical treatment options other than enucleation may be successful in managing pain and should be considered, although there are no known treatment options to fix the underlying DMD.

Descemet membrane is a thin layer of collagenous material that lays in close apposition with the anterior section of the cornea deep to the endothelial layer.2 Descemet membrane functions to keep the cornea dehydrated and provide a protective barrier from the anterior chamber.2 Descemet membrane can become detached for various reasons including secondary to glaucoma, ophthalmic surgery, or trauma.2–4 Diffuse corneal edema has been reported in equine patients as a sequela to DMD and is distinguishable from Descemet membrane rupture and separation which presents as focal corneal edema with concurrent loss of corneal stroma.4 The severe corneal edema in this patient made evaluation with a slit lamp challenging, thus ocular ultrasonography was performed. There have been
no reported correlations with EPM and DMD and it is considered unlikely that the patient’s previous clinical history was contributory to this diagnosis.

Ocular ultrasonography or ocular CT can be considered for further evaluation of the globe in cases of severe corneal edema. In normal patients, Descemet membrane is adhered to the posterior portion of the corneal surface. When detached, the membrane can be identified as a hyperechoic, curvilinear structure posterior to the cornea that remains attached at the iridocorneal angle, such as in this case. Confirmatory diagnosis for this disease process is reliant upon ocular imaging such as ultrasonography or ocular CT or a histopathology diagnosis consistent with DMD; however, diagnosis via histopathology may be complicated by processing artifact. In horses, a diagnosis of DMD upon histopathology accounts for 1% of all ocular abnormalities, and should be a differential diagnosis in patients with diffuse corneal edema.

The use of ultrasound in the diagnosis of ocular disease is a beneficial tool, that can be used in conjunction with ocular examinations. This is especially important for diseases with substantial corneal edema where full evaluation by slit-lamp biomicroscopy and ophthalmoscopy (direct and indirect) is limited.

Treatment for DMD is variable depending on the severity of the detachment. Medical management for this disease includes pain management (intraocular and/or systemic) and supportive care for any secondary abnormalities (eg, uveitis or corneal edema). Surgical techniques may also be employed to repair and reattach with reported improvement in clinical corneal clarity and thickness. If secondary abnormalities or pain cannot be controlled, enucleation may be elected, as with this case, and is a common therapy elected after medical management or surgical intervention has failed.

References