Optical coherence tomography (OCT) is an imaging technique that was first introduced in 1991 to evaluate the retina in humans but remains relatively novel in veterinary medicine. It has since become more widespread in its use toevaluate ocular structures, particularly the cornea and retina. The near microscopic (5 to 10 μm) detail achieved via OCT allows for sequential evaluation of lesions without the invasiveness of a tissue biopsy. This is especially useful in evaluating structures that are difficult to sample due to their depth (choroidal neoplasia), the associated vasculature (iris), or the potential to cause pain that may be incited following a tissue biopsy (eg, superficial lamellar keratectomy [cornea]). This technique also allows for sequential monitoring of lesions in response to medical or surgical therapy.

The first reported use of OCT in veterinary ophthalmology evaluated feline retinal structures. Several other veterinary species have since been evaluated, including 2 studies documenting the use of handheld spectral domain OCT (SD-OCT) to evaluate the normal cornea, retina, and optic nerve of horses. OCT has also been utilized to evaluate heterochromic iridocyclitis with secondary keratitis and Descemet membrane detachments and separations, and a case series describes a variety of ocular lesions in horses. To minimize motion artifacts, OCT is often performed in veterinary species while they are under general anesthesia (GA), whereas all published reports of OCT in horses involved standing sedation with local eyelid anesthetic blocks. However, limited data have been reported regarding the ease or repeatability of image acquisition or other limitations. Specifically, research is needed to evaluate the ease of obtaining OCT images with the addition of a retrobulbar anesthetic block (RB), which promotes globe and eyelid akinesia, thereby all but eliminating globe and eyelid movements.

Regional anesthesia is necessary for a variety of advanced ophthalmic examination techniques and ocular surgeries and has facilitated many procedures in horses under standing sedation, including enucleation, adnexal procedures, and even some corneal procedures. Region-
eral ophthalmic anesthesia is well developed in human medicine and is routinely used in a number of ophthal-
mic surgeries, allowing these surgeries to be performed on an outpatient basis without the use of GA. In veter-
inary ophthalmology, GA is more frequently required for patient cooperation and immobilization, especially for corneal and intraocular surgeries. Once a patient is under GA, systemic neuromuscular blockade is often used to facilitate a central globe position to improve vi-
sualization during surgery, as the eye may rotate ventr-
medially and obscure view of the surgical field in planes of anesthesia that are too light or too deep. Horses undergoing anesthesia are at risk for postanesthetic col-
ic as a result of anesthetic-associated decreased gastro-
intestinal motility, traumatic injuries (fractures) upon recovery, and potential neuromyopathy from positioning for the surgery. Horses undergoing ocular surgery are at particularly higher risk of having unsatisfactory recoveries from anesthesia due to the deeper plane of anesthesia often required for the surgery, compared with horses anesthetized for other types of surgery. Patients are also at greater risk of developing oculocardiac reflex-induced bradycardia from the pressure or traction placed on the eyes during surgery. Use of seda-
tion, RB, and supportive head restraint allows many ophthalmic procedures to be performed in standing horses while decreasing, or eliminating, the risks asso-
associated with anesthesia, anesthetic recovery, and postanesthetic hospitalization.

In addition to ophthalmic regional anesthesia facilitating globe immobilization, such anesthesia results in decreased postoperative pain scores, nausea and vomiting, and intraoperative incidence of the oc-
ulocardiac reflex in children undergoing vitrectinal surgery. While the RB has been utilized clinically for many decades in horses, there have been no in vivo studies evaluating RB in horses.

The purposes of our study were to determine whether the use of local anesthesia (RB) would improve ease of image acquisition and image quality via SD-OCT of the cornea and retina in standing horses similar to that of horses under GA and to document clinical (physiologic) variables affected by and com-
lications associated with RB. By measuring the time to loss of both sensory and motor reflexes, we aimed to determine the time of RB onset, thus allowing us to determine the optimal time to proceed with OCT imaging in sedated horses.

Materials and Methods

Animals

Six geldings from the Auburn University Teaching Herd were used. This number of horses was chosen because no sample size calculation could be performed without knowing the OCT acquisition times beforehand. The project was approved by the Auburn University Institutional Animal Care and Use Commit-
tee (protocol No. 2018-3435). Mean age of the 6 horses was 14.5 years (range, 11 to 20 years). Breeds included American Quarter Horse (n = 4), Thoroughbred (1), and Oldenburg (1).

Ophthalmic examination was performed after sedation of horses with detomidine hydrochloride (0.01 mg/kg, IV) and palpebral (1 mL, SC) and frontal (0.5 mL, SC) nerve blocks with 2% mepivacaine hydrochloride. Ophthalmic examination included retroillumination using a transilluminator, slit lamp bio-

Optical coherence tomography

Following evaluation of the CTT, OCT examina-
tions (EnvisuC2300; Biotopgen) were first performed in horses under standing sedation without RB or with RB followed by GA (coin toss). All OCT images were acquired by a single examiner (EMH), with the cor-
nea examined first and the retina examined second. Five (axial and 12, 3, 6, and 9 o’clock perilimbal) re-

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diagnostic; 4 = excellent; Supplementary Videos S1 and S2 for the cornea and retina, respectively). The same corneal locations were evaluated via OCT using a 6 X 6-mm rectangular volumetric scan. Five different regions of the optic nerve head (ONH; axial, dorsal, ventral, nasal, and temporal) and adjacent retina were imaged. The number of attempts to obtain these scans, total scan time, and image acquisition times were recorded. For total scan time, the clock was started when the operator began aiming the OCT scanning head and stopped when all the corneal or retinal images were acquired. For image acquisition time, the clock was started when the operator began aiming the OCT scanning head and stopped when the individual scan was completed.

The grades for both the corneal and retinal scans accounted for the percentage of the b-scan centered within the registration window “scans in frame” (100 frames/scan; Appendix). A scan’s numerical grade was further reduced 1 numerical grade if oblique, out of focus, or significant movement (up and down) occurred within the frame.

Retinal images were additionally graded on the basis of the examiner’s ability to accurately focus on the ROI within the ONH (axial or 12, 3, 6, or 9 o’clock border) in the volume intensity projection (VIP). This reinforced the accuracy of aiming the OCT scanning head in the absence of lesions because a drift of gaze or spontaneous movement can be a detriment to obtaining diagnostic images of a lesion. So, in addition to analyzing the b-scans for their percentage in frame, use of landmarks like clock faces of the ONH in en-face views helped to ensure stability of the image throughout the frame, improving the diagnostic yield. The clock face landmark of the ONH was identified in the VIP. A bulls-eye target, made up of 3 rings with a radius of 1, 2, or 3 mm (measured internally with calipers; Figure 1), was created to grade the scans. If the ONH landmark was within the first circle (1 mm radius) it received a grade 4, within the second circle (2 mm radius) it received a grade 3, and within the third circle (3 mm radius) it received a grade 2. If the ONH landmark was outside the third circle it received a grade 1, and if the image was not readable it received a grade 0. If the ONH landmark was on the border of 2 rings, it was graded as the lower of the 2 scores.

Horses were returned to their pastures after recovering from standing sedation. They were reevaluated at least 14 days after the first OCT examination, and then a second OCT examination was performed with the alternate examination condition.

RB, GA, and CT of the head

To facilitate GA, a 16-gauge IV catheter was placed in a jugular vein. For the RB, the orbital fossa was clipped and aseptically prepared with diluted baby shampoo and betadine scrub (1% solution). A 22-gauge, 3.5-inch spinal needle was placed through the skin perpendicularly to the skull into the orbital fossa, just caudal to the posterior aspect of the bony dorsal orbital rim. The needle was aimed toward the base of the opposite mandible body and steadily advanced caudally to the globe, until it reached the retrobulbar orbital cone. Needle contact with the periorbital fascia will cause the eye to rotate dorsally. As the needle passes through the fascia, the globe will appear to drop, returning to its original position. A 10-mL bolus of 2% mepivacaine and 2 mL of 76% iopamidol solution (Isovue-370; Bracco Diagnostics) was injected into the retrobulbar space, resulting in slight external globe displacement (exophthalmos). The time to onset of the local anesthesia was quantified by the abolished corneal sensation. Pupil diameter was measured using a Jameson caliper in the horizontal and vertical dimensions and was used to calculate pupil area. Eyelid blocks were performed following assessment of CTT. Akinesia was graded as follows: 0 = no effect (spontaneous blinking, retraction, and third eyelid and globe movement); 1 = intermittent retraction, third eyelid movement, and globe movement; 2 = infrequent globe retraction and third eyelid movement; and 3 = no palpebral reflex, retraction, third eyelid movement, or globe movement.

Following OCT under sedation (detomidine and butorphanol) with RB, horses were walked from the standing surgery suite to the induction stall (they had minimal residual sedation by this time). They were then premedicated with xylazine (1.1 mg/kg, IV). Once their heads drooped below their knees (approx 5 minutes), anesthesia was induced with ketamine (2.2 mg/kg, IV) and midazolam (0.05 mg/kg, IV). General anesthesia was maintained with triple drip (ie, 1 L of 5% guaifenesin + 500 mg of xylazine + 2 mL of 2% mepivacaine) with intermittent administration of midazolam. A 10-mL bolus of 2% mepivacaine was placed in the ventral perineural space of the conus medullaris. A 16-gauge IV catheter was placed in the jugular vein of the contralateral side, and repeated administration of anesthetic agents were given. The same corneal locations were examined using a 6 X 6-mm rectangular volumetric scan. The b-scan was overlayed on the volume intensity projection (VIP). Scores are assigned based on the location of the region of interest (ROI) within the various rings as follows: 1-mm radius (grade 4), 2-mm radius (grade 3), 3-mm radius (grade 2), and outside 3-mm radius (grade 1). A grade of 0 was assigned if the VIP was unreadable.
g of ketamine administered IV at 2 to 3 mL/kg/h). Horses were intubated, and GA was maintained with inhalation anesthetic (isoflurane) during CT (Lightspeed 64-slice VCT machine; GE) scanning.

All OCT images were graded by a single investigator (EMH). Computed tomography was performed to evaluate the accuracy of blind RB placement within the intraconal or extracanal space to record any influence that the distribution of local anesthetic within the orbit may have had on the acquisition of OCT images. Each RB was administered by the same investigator (EMH) and scored as intraconal, extracanal, or mixed (primarily intraconal or primarily extracanal) by a board-certified radiologist (RCC). The CT images were evaluated for scleral puncture (contrast within the globe), subdural spread of local anesthetic along the optic nerve, puncture of the optic nerve, intraocular administration, or retrobulbar hemorrhage (significant expansion of the retrobulbar cone). The OCT cornea and retina protocols were repeated in the recovery stall with the horses positioned in lateral recumbency and remained under GA.

A temporary tarsorrhaphy using 2-0 nylon suture was placed upon completion of the OCT protocols in 3 horses to protect the globe during recovery. The temporary tarsorrhaphy was removed immediately upon recovery in 1 horse and the morning after the anesthetic event in 2 horses.

Horses were returned to their pasture or monitored and maintained on stall rest until the following morning after anesthesia. Horses were scored for blepharoedema and chemosis following recovery or removal of the tarsorrhaphy on a scale of 0 to 4 (blepharoedema: 0 = none and 4 = severe, causing an inability to blink or completely obscuring the corneal surface; chemosis: 0 = none and 4 = severe, extending beyond the lid margin, preventing normal palpebral [eyelid] closure).

Horses with a chemosis or blepharoedema score of 4 were to be administered a single dose of flunixin meglumine (1.1 mg/kg, IV or PO). Horses were examined for corneal ulceration upon recovery and the following morning with fluorescein. If corneal ulceration developed, horses were examined once daily with fluorescein until resolution of the ulceration and the time of resolution was recorded. The affected horses were treated with neomycin and polymyxin B sulfate and bacitracin ophthalmic ointment, 3 times daily in the affected eye until resolution.

**Statistical analysis**

All analyses were performed using statistical analysis software (SAS 9.4; SAS Institute Inc). A significance threshold of 0.05 was used. Results are reported as mean ± SD. Scan and acquisition times were summed over all scans per sedation type, over all scans per clock hour position, and over all scans for each sedation type and clock hour position.

Generalized linear mixed models (GLMMs) were utilized to analyze total number of scans and scan grades for the cornea and retina and also VIP grades and percentage readable for retina scans. Linear mixed models were utilized to analyze total scan and acquisition times and percentage time in frame. Histograms and Q-Q plots of conditional LMM residuals were examined to evaluate the assumption of normality. Total scan and acquisition times were analyzed with LMMs that assumed that conditional model residuals (conditional on each horse) were normally distributed. Conditional model residual histograms and Q-Q plots were found to be in some cases left-skewed and in most cases to have nonhomogeneous variance (residuals vs predicted). After logarithmic transformation, the Q-Q plots confirmed normality of all model residuals. Total number of scans was not normally distributed and was analyzed with a GLMM with a negative binomial distribution as appropriate for count data. Scan grades and VIP grades were also analyzed with GLMMs assuming a multinomial distribution with a cumulative logit link. The readability of the VIP window (VIP readable: yes or no) was also analyzed with a GLMM with a binomial distribution.

Plots of conditional residuals versus predicted values of measurements were examined to evaluate the assumption of homogeneity of variances. Variance increased with times so both scan and acquisition time totals were logarithmically transformed prior to analysis to meet the assumption of homogeneity of variance.

Models had a fixed factor of sedation type for comparisons between sedation types. Alternatively, models had a fixed factor of clock hour position for clock hour comparisons. Models had fixed factors of sedation type and clock hour position and a sedation type by clock hour interaction term for sedation type comparisons at each clock hour position and clock hour comparisons for each sedation type. A random factor of horse was included in all models to account for within-horse correlation of repeated scans (over sedation types and clock hour) within each horse. Multiple comparisons were corrected for with the Tukey test. A negative binomial distribution with log-link function was assumed for number of scans, whereas a multinomial distribution with cumulative logit-link function was assumed for grades and a binomial distribution with logit link function for percent readable.

**Results**

The right eye was examined in 2 horses and the left eye in 4 horses. Three horses were examined first under standing sedation, while the other 3 horses were first examined under sedation with RB followed by GA. They were then examined under the second examination condition at least 2 weeks afterwards so that all horses underwent all 3 types of examination in triplicate.

Diagnostic OCT images were obtained under all 3 sedation conditions. Results for the cornea are reported in the following order: standing sedation without an RB (ie, the standing sedation condition), standing...
sedation with RB (ie, the RB condition), and GA with RB (ie, the GA condition). Mean ± SD total cornea scan attempts were 24 ± 8, 23 ± 6, and 17 ± 3, respectively (GLMM, \( P = 0.127 \); Figure 2). Mean total cornea scan times were 14.6 ± 5.4 minutes, 13.2 ± 7.6 minutes, and 9.2 ± 3.6 minutes, respectively (LMM, \( P = 0.188 \)). Mean cornea grades (0 to 4) were 2.0, 2.3, and 2.5, respectively. Cornea OCT grades were significantly lower during standing sedation (with no RB) than during RB (GLMM, \( P = 0.004 \)) or GA (GLMM, \( P < 0.001 \)). Mean percentage in frame (percentage of 100) for cornea scans was 47.4 ± 22.5%, 52.8 ± 24.1%, and 62.6 ± 20.7%, respectively, and was significantly higher during GA than during RB (LMM, \( P = 0.005 \)) or standing sedation (LMM, \( P < 0.001 \)).

Total corneal acquisition times were not significantly (LMM, \( P = 0.912 \)) different between clock hour positions. Total corneal acquisition times at the 9 o’clock position were significantly lower during GA than during RB (LMM, \( P = 0.030 \)) or standing sedation (LMM, \( P = 0.029 \)). Total corneal acquisition times were significantly higher during standing sedation than during RB (LMM, \( P = 0.020 \)) or GA (LMM, \( P = 0.045 \)). There were no significant differences in total corneal acquisition times between clock hour positions during any sedation condition (LMM).

Results for the retina are also reported in the following order: standing sedation condition, RB condition, and GA condition. Mean ± SD total retinal scan attempts were 23 ± 7, 19 ± 2, and 19 ± 4, respectively. There were no significant (GLMM, \( P = 0.209 \)) differences in the number of OCT retina attempts between sedation conditions. Mean total retina scan times were 19.1 ± 7.6 minutes, 9.2 ± 2.9 minutes, and 13.0 ± 4.3 minutes, respectively (LMM). Total retinal scan times were significantly (\( P = 0.21 \)) higher during standing sedation than during RB. Mean total retina scan times and corneal total scan times were not significantly different between clock hour positions.

Respective mean retinal acquisition times for standing sedation, RB, and GA were 8.6 ± 3.6 minutes, 5.9 ± 1.2 minutes, and 8.2 ± 3.0 minutes. These were not significantly (\( P = 0.220 \)) different between groups (LMM). Mean retina grades were 2.7 ± 1.3, 2.9 ± 1.0, and 2.5 ± 1.2, respectively. Retinal OCT grades were significantly (\( P = 0.030 \)) lower during GA than during RB (GLMM).

Mean percentage in frame for retina scans was 65.7 ± 31.8%, 70.9 ± 25.9%, and 61.0 ± 27.2%, respectively. Percentage in frame for retina scans was significantly (\( P = 0.032 \)) lower during GA than during RB (LMM). Total retinal acquisition times were not significantly (\( P = 0.220 \)) different between groups (LMM). There were no significant differences in total retinal acquisition times between sedation conditions at any clock hour positions. There were no significant differences in total retinal acquisition times between clock hour positions and sedation conditions. Significantly (\( P = 0.007 \)) more retinal VIP scans were readable with RB (97.32%) than with SS (83.57%), but no significant (GLMM, \( P = 0.058 \)) difference was observed when compared with GA (87.83%). Retinal VIP grades were significantly (\( P < 0.001 \)) higher during RB than during GA or standing sedation (GLMM). Mean retinal VIP grade was 3.0 ± 1.5 for standing sedation, 3.7 ± 0.8 for RB, and 3.1 ± 1.3 for GA.

Figure 2—Mean ± SD results for optical coherence tomography (OCT) of the cornea (A to C) and retina (D to F) in 6 healthy geldings examined under standing sedation without RB, standing sedation with RB, and general anesthesia (GA) with RB. A and D—Number of OCT attempts. B and E—Total scan time. Total retinal scan times were significantly (\( P = 0.021 \)) higher during standing sedation than during RB. C and F—Percentage of scans in frame. For the cornea, percentage of scans in frame was significantly higher during GA than RB (\( P = 0.005 \)) or SS (\( P < 0.001 \)). Retinal OCT grades were significantly (\( P = 0.030 \)) lower during GA than during RB.
Complications

Superficial corneal ulceration occurred in 2 horses following GA, and this ulceration healed 2 or 4 days after the experiment. Both of these horses were examined under GA first and had temporary tarsorrhaphies placed. The ulcers were not noted prior to tarsorrhaphy, only upon removal. Both of these horses had chemosis (2+ and 1+), and 1 had blepharoedema (2+). Three horses had chemosis, 1 horse with a score of 1 and the other 2 with a score of 2. None of the horses required treatment for blepharoedema or chemosis because these conditions resolved within 24 hours.

Discussion

An RB provides globe akinesia and mydriasis to help facilitate imaging that requires a fixed gaze. Although historical or anecdotal reports exist of vision- or life-threatening complications attributed to RB, no such complications were documented in the present study. In an equine cadaver study involving ultrasound-guided RB, successful intraconal needle placement was confirmed in 22 of 34 orbits. There were also 6 extraconal blocks in which contrast solution reached the orbital fissure. In that study, undiluted contrast solution was injected, instead of the mixture of local anesthetic with contrast solution used in our study. The lower volume of contrast solution used in our study may have influenced its distribution and visualization on CT scan. However, because our main objective was to observe the clinical effects of RB, we elected to use the described diluted solution. At least some intraconal contrast solution was present in 4 of 6 RBs. Because the retrobulbar cone is permeable to injected materials, contrast solution may first appear in the extraconal space and diffuse intraconally or vice versa. Given that most of the contrast solution in the horses with mixed distribution was intraconal, and due to the prolonged time that elapsed between RB administration and head CT, we suspect that these blocks may have been intraconal but diffused extraconally over time. The extraconal RBs had a ventral distribution outside of the retrobulbar cone, which may have represented settling with gravity or driving of the needle through the ventral aspect of the cone. Orbital ultrasound or CT at the time of needle placement may be helpful in elucidating these placement factors in the future.

While there have been no reports of ophthalmic complications following RB in horses, complications such as suspected brainstem anesthesia have been reported in cats. Oel et al found that an RB can prevent the decrease in heart rate associated with initiation of the oculocardiac reflex in horses undergoing enucleation under GA. An RB performed with > 10 mL of lidocaine has been reported to be associated with an increased risk of postanesthetic colic in horses, compared with the risk for horses undergoing other types of surgery (eg, orthopedic, soft tissue, and imaging procedures).

Self-limiting complications such as chemosis, blepharoedema, and corneal ulceration occurred in several of the horses in the present study, especially for the GA condition. These complications may be reduced by using the lowest effective volume of anesthetic, adequate corneal hydration, lubrication, and tarsorrhaphy. However, 2 of the horses in the study developed corneal ulceration with the tarsorrhaphy in place. The distribution of local anesthetic following an RB may unevenly affect the degree of mydriasis (extraconal had less pronounced mydriasis), but even extraconal blocks provided akinesia and a decreased CTT. Without the use of CT to localize the block, mydriasis may be the most effective parameter for gauging intracanal distribution. The dorsal approach of the RB through the supraorbital fossa is unique to horses and
provides an alternative approach separate from the surgical site that potentially reduces chemosis, which can obscure visualization. Given the procedures horses with infectious keratitis are often presented for, the dorsal approach reduces the risk of seeding infectious organisms deeper in the periocular or orbital tissues, as may occur with a sub-Tenon's block.

Use of SD-OCT and related values have been published for normal equine cornea and retina measurements in standing sedated horses.\textsuperscript{3-4} This imaging technique has also been used to describe clinical cases of corneal and uveal diseases.\textsuperscript{5-11,28} No scales have been established to grade the quality of OCT images for the cornea and retina, but scales used to grade aqueous humor flare using time domain OCT have been reported.\textsuperscript{28}

Diagnostic image quality should distinguish layers of the cornea including the epithelium, stroma, and Descemet membrane/endothelial complex as well as the layers of the retina. In the present study, images with motion artifact and an inability to distinguish these layers were saved and recorded in number of attempts. Images were graded based on anatomical detail, scan completion (motion blur that led to incomplete data-acquisition sets), and image resolution throughout the clip. Although diagnostic images were obtained under all sedation conditions (standing sedation, RB, and GA), the RB improved the percentage of scans in frame and ROI accuracy for retinal imaging. Retinal OCT grades were significantly lower for GA than for RB. Even though there was no discernible movement during scanning during GA, maintaining a steady position with the OCT instrument above the laterally recumbent horse's head for a prolonged period contributed to micromovements that were magnified as large motion artifacts during these scans. Our results suggested that the most accurate retinal imaging is accomplished under standing sedation and that the RB helps to facilitate aiming and stabilization of the OCT scanning head to focus on a given anatomic landmark, which may translate clinically to aiming at a pathologic lesion and minimize motion artifacts. There were significantly higher total retinal scan times during standing sedation than during RB, which may have been attributable to optical challenges inherent to imaging the posterior segment of the eye. Total corneal scan times were significantly higher during standing sedation than during GA or RB at the axial position. Total corneal acquisition times were significantly lower during GA than during RB or standing sedation at the 9 o’clock position and were higher during standing sedation than during RB or GA at the axial position.

The axial position was the first area imaged, and the order of locations imaged was not randomized in the present study. The longer acquisition times at the axial position may be explained by the fact that the horses under standing sedation were settling into the sedation more at this time than during RB, when they had time after their sedation for the RB to take effect and cause loss of the CTT, creating a more level plane of sedation. However, total retinal scan times were also higher during standing sedation than during RB in the axial position, and total retinal acquisition times were also significantly higher at the axial position than at the 9 or 12 o’clock positions. The prolonged retinal axial total acquisition times may weaken the assumption that level of sedation plays a substantial role in the more prolonged times at the axial location because the retinal imaging was always performed second, so the horses should have been in a fairly deep plane of sedation, and yet the prolonged time at the axial location persisted. The prolonged axial total acquisition times may instead indicate that the operator requires more time during the initial scans of the cornea or retina to establish positioning of the handheld instrument to appropriately focus on the structure of interest.

Randomizing the areas scanned may help elucidate whether the axial location inherently requires a longer time or the first anatomic location requires a longer time to acquire scans, related to horses settling in following sedation, as opposed to the operator “finding rhythm” and appropriate positioning of the instrument after the first scan. Neither total scan time nor number of corneal scan attempts differed significantly between standing sedation and RB in the present study. Although the RB was not documented to cause any long-term complications, globe and life-threatening complications have been reported,\textsuperscript{3,5,25} and it is possible that the small sample size did not allow such complications to be detected.

In conclusion, the present study provided evidence that OCT quality of the cornea and retina can be improved in horses with the RB in regard to grade of scan and aiming (VIP). Despite differences between sedation conditions, OCT images of good diagnostic quality can be obtained in horses under standing sedation, and that image quality can be improved by using an RB. The risks associated with GA outweigh the benefits for this imaging modality in this species. Whereas OCT can be accomplished under all 3 of the evaluated sedation conditions in horses, the advantages of globe immobilization, gaze fixation, and mydriasis improve the ability to obtain higher percentages of scans in frame for the cornea when GA is used and for the retina when RB is used. The ability to focus on a given retinal landmark in a VIP was better when horses were under standing sedation or RB. Given the length of time the block took to achieve its effect and the perceived risks, performing an RB solely for diagnostic imaging purposes appears unnecessary given that the RB did not decrease the number of attempts or total scan time in horses.

**Acknowledgments**

Funded by the Birmingham Racing Commission Research Agreement 12/11/2018 under AU Fund 250441 and the Auburn University Department of Clinical Sciences.

The authors thank Jessica Brown and Stephanie Mitchell for their help with this project as well as Deborah Keys for her assistance with the statistical analysis.
Grading scheme for optical coherence tomography images of horses based on percentage of time in frame.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage time in frame</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0–10</td>
<td>Nondiagnostic</td>
</tr>
<tr>
<td>1</td>
<td>11–25</td>
<td>Poor, with minimal movement or artifact</td>
</tr>
<tr>
<td>2</td>
<td>26–50</td>
<td>Good, diagnostic frames, with minor movement or artifact</td>
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<tr>
<td>3</td>
<td>51–75</td>
<td>Great, diagnostic frames, with mild movement or artifact</td>
</tr>
<tr>
<td>4</td>
<td>76–100</td>
<td>Excellent, diagnostic frames, with minimal movement or artifact</td>
</tr>
</tbody>
</table>

References


Supplementary Materials

Supplementary materials are posted online at the journal website: avmajournals.avma.org

Appendix

Grading scheme for optical coherence tomography images of horses based on percentage of time in frame.