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Evaluation of the posterior segment of the equine eye is an essential part of an ophthalmic, pre-purchase and general physical examination. Initial examination includes a history with respect to vision, determination of menace and pupillary light responses (PLR) and evaluation of clarity of transmitting media (cornea, aqueous, lens, vitreous). While it is possible to examine portions of the fundus without dilation, to properly examine the posterior segment of the equine eye, mydriasis, a darkened environment and proper equipment are essential. Diagnostic mydriasis is achieved using topical 1% tropicamide (Mydriacyl), which has an onset of action of 15–25 min and duration of 8–12 h. If required, sedation and nerve blocks can be performed to facilitate examination. The auriculopalpebral nerve when blocked will facilitate examination by allowing the clinician to elevate the superior eyelid.

Both direct and indirect ophthalmoscopy should be used for examination of the equine posterior segment. Indirect examination is performed initially for an overview of the fundus and direct ophthalmoscopy preferred for detailed examination of the optic nerve and retinal blood vessels. Indirect examination, using a 20 diopter condensing lens and a finoff transilluminator will give a more panoramic, but less magnified view of the fundus with lateral and axial magnification of x0.79 and x0.84 respectively. Indirect examination provides better visualisation of the peripheral retina. Indirect examination can also be performed using an indirect headset that gives stereopsis and leaves the examiner a free hand to elevate the superior eyelid. Indirect examination allows visualisation of the fundus through cloudy transmitting media, such as aqueous flare or lenticular sclerosis, which is often not possible with direct examination. To perform indirect examination, the light is held at arms length from the horse’s eye, a tapetal reflection obtained and a condensing lens placed 2–8 cm in front of the horse’s eye. A virtual, upside down, reversed image is created. If a headset is used it will provide the illumination and allows the examiner stereopsis. Alternately, a device called a PanOptic ophthalmoscope can be used. This is an indirect, monocular ophthalmoscope that provides an erect image with a field of view greater than that provided by direct examination.

Direct examination provides the greatest magnification with lateral and axial magnification of x7.9 and x8.4 respectively. Direct ophthalmoscopy should be used for detailed examination of the optic nerve, retinal blood vessels and peripapillary region. To examine the posterior segment the direct ophthalmoscope is set to D diopters and the ophthalmoscope held approximately 2 cm from the horse’s eye. The optic nerve should be in focus for most examiners at this setting. Changing the diopter settings will allow the clinician to focus vitread or more posterior to determine if an abnormality is elevated or depressed respectively. The image obtained with a direct ophthalmoscope is upright and magnified. Abnormalities of the cornea, aqueous, lens and vitreous make direct examination difficult. In such instances, indirect examination should be performed.

When examining the posterior segment what the clinician sees is dependant on colour and thickness of the 3 concentric tunics, the retina, choroid and sclera that comprise the posterior eyewall. The neurosensory retina has the optical consistency of wax or tissue paper, rendering tissues below less reflective and dull. A loss of retinal tissue will therefore increase the reflectivity and colour of the underlying tissue. This is termed hyperreflectivity in the tapetal fundus. Alternately, thickening of the retina (e.g. oedema, cells, dysplasia) will obscure and dull the underlying tissue. The outermost layer of the retina is the monolayer; retinal pigment epithelium, which is pigmented in the ventral nontapetal fundus. Alternately, thickening of the retina (e.g. oedema, cells, dysplasia) will obscure and dull the underlying tissue. The outermost layer of the retina is the monolayer; retinal pigment epithelium, which is pigmented in the ventral nontapetal fundus and nonpigmented over the tapetum in most horses. The choroid is comprised of melanin containing cells, blood vessels and dorsally, the fibrous tapetum. The outermost tunic, the sclera, appears white. The colour of the horse, amount of melanin and thickness of the tapetum all influence the normal appearance on fundic examination. Normal variations are common and the clinician must be familiar with these before being able to interpret and understand abnormalities.

Posterior segment examination should include evaluation of the vitreous, tapetal and nontapetal fundus, retina, retinal blood vessels and optic nerve. Variations in the normal equine fundus are common and familiarity with these variations is essential. Additional diagnostic tests may include ocular ultrasonography, CT scan, electroretinography and visual evoked potential.

Abnormalities on fundic examination include vitreous degeneration, membranes, inclusions and vascular remnants, changes in size, shape and colour of the optic nerve and retinal vessels, elevation or depression of the optic nerve, retinal dysplasia, detachment, haemorrhage, changes in tapetal reflectivity (hyper- and hyporeflective), and changes in pigmentation. Most abnormalities are identified in the peripapillary region and can be visually significant as this area has a
greater concentration of retinal axons. Abnormalities that are hyper-reflective indicate thinning or loss of retinal tissue and are observed in the tapetal fundus. Hyporeflective changes can indicate an increase in tissue thickness resulting from cellular infiltrates, oedema or folding of the retina as seen in retinal dysplasia. Hyporeflective changes appear as dull grey-white depending on the background (tapetal vs. nontapetal). In addition, the retina may appear elevated. Inflammation can result in depigmentation and pigment clumping in the nontapetal fundus and hyperpigmentation in the tapetal fundus. These must be differentiated from normal variations in pigmentation of the RPE.

Posterior segment abnormalities can be congenital or acquired and include both primary ophthalmic and systemic diseases. When present, posterior segment abnormalities must be assessed with respect to current and future visual impact and importance with respect to usefulness and safety of the horse. Despite the significance of the retina and choroid to vision, little is known about posterior segment diseases when compared to the equine anterior segment or posterior segment of other species. This may be a result of less inherited abnormalities and fewer infectious/haematogenous diseases as a result of the paurangiotic retina or may simply reflect a lack of examination of the equine posterior segment by veterinarians.

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