Equine retinal detachment in the United Kingdom: 23 cases (2010-2020)

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**Summary**

**Background:** Few reports describe the aetiology, presentation and diagnosis of retinal detachment in horses. Equine recurrent uveitis (ERU) and trauma are the most common causes of equine retinal detachment in the USA, but no studies have characterized the disease within the UK.

**Objectives:** To describe clinical presentation, aetiology and diagnostic examination findings of horses with retinal detachment within a UK-based population.

**Study design:** Retrospective case series

**Methods:** Medical records of horses presented to a single UK referral centre between 2010 and 2020 were reviewed. Horses were diagnosed with retinal detachment by clinical examination and/or ultrasonography, and details of clinical presentation, aetiology and examination findings were recorded.

**Results:** 23 horses were included. There were 13 geldings and 10 mares with a median age 9 at presentation (range 4 days – 17 years). Warmbloods were the most common breed (n=8). Unilateral cases (n=21) were more common than bilateral (n=2). ERU was the most common aetiology (n=10) followed by trauma (n = 8). Three cases presented post-intraocular surgery, one congenital and one secondary to primary glaucoma. Ultrasound confirmed diagnosis in 23 (100%) cases, but only nine could be visualized by direct ophthalmoscopy. Cataracts, posterior synechiae and vitreal debris were found commonly in both the ipsilateral and contralateral eye affected.

**Main limitations:** Small sample size.Single centre retrospective study which may not be representative of the entire UK population. Histological confirmation of cases was not obtained.

**Conclusions:** Causes of retinal detachment in the studied population are like those previously reported in the USA and most cases presented with complete detachment. Ocular ultrasound is useful in the diagnosis of retinal detachment when the fundus cannot be directly assessed. The presence of retinal detachment should be considered in non-visual eyes presenting with cataracts, vitreal debris and posterior synechiae.

**Clinical relevance:**

* Retinal detachment in horses is sparsely described in literature and reports of common aetiologies in the UK horse population are lacking.
* The utility of ultrasonography in diagnosis reported here concurs with previous literature and should encourage practitioners to consider this as part of their ocular evaluation.
* Cataracts, vitreal debris and posterior synechiae in a non-visual eye should alert the practitioner to the possibility of retinal detachment. The presence or absence of this guides prognosis for vision and clinical decision making.

Introduction

Retinal detachment is defined as the separation from the inner neurosensory cell layer from the outer retinal pigmented epithelium (Gilger, 2022). This manifests clinically as partial or complete vision loss in the affected eye, which can compromise the likelihood of return to the horse’s previous performance level (Utter *et al.,* 2010) or potentially result in euthanasia if the condition is bilateral.

Reports documenting retinal detachment in horses within the literature are sparse, but previous cited causes include equine recurrent uveitis (ERU), complications of intra-ocular inflammation , secondary to trauma, congenital ocular anomalies, optic neuritis and post-phacoemulsification (Mätz-Rensing *et al.*, 1996; Strobel *et al.*, 2007; Edelmann *et al.*, 2014).

A single previous publication describes clinical presentation, diagnosis, treatment and outcome in a USA hospital population (Strobel *et al.,* 2007). Other ophthalmic conditions have been shown to differ in their clinical presentation and disease progression with respect to different geographical regions (Matthews and Gilger, 2009). The aforementioned study cites equine recurrent uveitis (ERU) as the most common cause of retinal detachment in the USA, but the prevalence of this disease in the UK has consistently been reported to be much lower, with recent data suggesting *Leptospira* as an uncommon aetiology compared to Europe and the USA (Malalana *et al.*, 2017). The aetiological and clinical findings in a UK equine patient population with retinal detachment are currently unreported.

The purpose of this retrospective study is to describe the aetiology, clinical presentation and diagnostic examination findings in horses with retinal detachment within a UK-based hospital population.

Materials and Methods

Medical records of horses presented to the Philip Leverhulme Equine Hospital, University of Liverpool between January 2010 and December 2020 were searched for a diagnosis of retinal detachment. Ophthalmic examination was performed in each case, including indirect and direct ophthalmoscopy and assessment of vision, including pupillary light reflex, menace response and dazzle reflexes. Indirect ophthalmoscopy was performed using a standard 20 diopter handheld lens with a light source (Finoff transilluminator; Heine)1, and direct ophthalmoscopy was performed with an ophthalmoscope (Beta 200; Heine)1. Ultrasonography of the globe was performed in all cases, using a transpalpebral technique with a linear probe of 9-12MHz (11L, Logiq S8; GE Healthcare). Images were acquired in both the sagittal and transverse planes. Sedation using detomidine hydrochloride, or romifidine hydrochloride alone or in combination with butorphanol were used to facilitate the examination if deemed necessary. A palpebral nerve block using 1-2ml of mepivacaine hydrochloride was also performed if required.

Horses were eligible for inclusion in the study if a diagnosis of retinal detachment was reached. Horses were diagnosed with retinal detachment based on clinical and ultrasonographic appearance. Retinal detachment is visualised ultrasonographically as two hyperechoic lines extending from the optic nerve to the ora ciliaris on either side, within the posterior segment. This creates the characteristic “seagull wing” appearance. Retinal detachments were diagnosed as either partial or complete. Partial detachments appeared as focal hazy areas of retina with subretinal accumulation of fluid. Complete detachments generally presented as grey sheets of tissue emanating from the optic nerve. Clinical and ultrasonographic findings were considered together to give a diagnosis of retinal detachment (Gilger, 2022) (Figure 1a, 1b).

Case details were recorded, including age, breed, sex, presenting signs and aetiology. Aetiology was determined either from the clinical history (e.g. history of recent trauma, previous recurrent episodes of uveitis, recent intra-ocular surgery) or concurrent abnormalities within the eye (e.g. the presence of posterior synechiae and dyscoria in uveitic eyes indicating chronic recurrent episodes). Information regarding the eye affected, concurrent ipsilateral and contralateral ocular pathology, whether the detachment was partial or complete, and whether the condition was uni- or bilateral was also extracted.

Results

A total of 23 horses were included in the study. There were 13 geldings, and 10 mares, including one 4-day-old filly. The median age of presentation was 9 years (range 4 days- 17 years). Warmbloods (n=8), Cobs (n=4), Welsh breeds (n=3), Andalusians (n=1), Lusitanos (n=1), Haflingers (n=1), Shetlands (n=1), Polo Ponies (n=1), Thoroughbred crosses (n=2) and unknown breeds (n=1) formed the patient population.

The right eye presented with the condition in 11/23 (47.8%) cases. The left eye presented in 10/23 (43.5%) cases, and in 2/23 (8.7%) cases the condition was bilateral. The most common reasons for initial presentation to the clinic were assessment of previously diagnosed uveitis (n=6), or cataracts (n=5), with (n=3) presenting with a history of known trauma, and (n=3) presenting at post-intra-ocular surgery assessment. Two cases presented due to abnormal ocular appearance, and apparent blindness or loss of vision was the primary reason for presentation in two cases. One case was also presented for suspected glaucoma, and another as part of a pre-purchase examination. Case details and presenting complaints are summarized in Table 1.

Menace response, pupillary light reflexes (PLR) and dazzle reflexes were absent in 14/22 (63.7%) cases. A weak PLR was present in 8/22 (36.4%) cases, and a menace response and/or dazzle reflex also remained in three of those eight cases. In one case the responses to vision tests were not recorded. All cases which retained menace responses or dazzle reflexes were deemed to have partial detachment, and three cases with a weak PLR had complete detachment. In one case with a PLR, the nature of retinal detachment was not recorded.

All cases underwent complete ophthalmic and ultrasonographic examination. Retinal detachment was diagnosed on ophthalmic examination of the retina in conjunction with ultrasound in 9/23 (39.2%) cases, and 14/23 (60.8%) cases were diagnosed on ultrasound alone, due to an inability to visualize the fundus. Ultrasound was confirmatory of retinal detachment in 23 (100%) cases. Cataracts obscured the fundus in 9/14 (64.0%) cases, hyphaema in 3/14 (21.4%), anterior chamber fibrin in one case and corneal oedema in another case.

The most common aetiology recorded was ERU, which occurred in 10/23 (43.5%) cases, followed by trauma in 8/23 (35.0%) of cases. All cases defined as ERU had either a clinical history of recurrent episodes, or intra-ocular changes associated with recurrent uveitis. Trauma was diagnosed from clinical history. Other recorded aetiologies were as post-surgical complications in three cases, one congenital case in a 4-day-old foal and one due to primary glaucoma (Figure 2). This case was diagnosed as such because it presented with increased intra-ocular pressure (IOP) (as measured by rebound tonometer2), buphthalmos and retinal detachment in the absence of signs of chronic uveitis or active inflammation, or signs of any other causative pathology e.g. neoplasia.

In 17/22 (77.3%) cases, the detachment was considered complete at the time of presentation, 5/22 (22.7%) had partial detachment, and in one case the information was not recorded (Table 2).

Of the horses included, 23/25 affected eyes displayed concurrent ipsilateral pathology in addition to retinal detachment, and for two cases this information was not recorded. Of the 21 cases of unilateral retinal detachment, 10 cases (47.6%) also demonstrated abnormalities in the contralateral eye, 11 cases (52.4%) had no ocular abnormalities in the contralateral eye.

Of the 21 unilaterally affected cases, the most common ipsilateral pathology recorded was the presence of a cataract (n=11, 52.4%), followed by posterior synechiae (n=8, 38.1%) and vitreal debris (n=4, 19.0%). Periorbital soft tissue pathology and hyphaema were reported in three cases, along with aqueous flare in two cases, lens subluxation in two cases, changes in IOP in two cases, corneal oedema in two cases and corneal opacity in two cases. The presence of iris rests, corneal ulceration, and Haab’s striae were each reported in single cases. In unilaterally affected cases, cataracts were also the most frequently identified abnormality in the contralateral eye (n=6, 28.6%), followed by vitreal debris (n=5, 24.0%). Iris rests, changes in IOP, corneal oedema, leucochoria, buphthalmos, chorioretinitis, band keratopathy and iris cyst were each reported in single cases (see Table 3).

In the two bilateral cases, cataracts, corneal oedema, aqueous flare, anterior chamber collapse and vitreal debris were identified in both eyes in one case, and corneal ulcers were identified in both eyes in the other (see Table 4).

Discussion

Retinal detachment in horses is a serious condition which invariably results in partial or complete vision loss in the affected eye. It occurs when there is a cleavage in the plane between the inner neurosensory retina and the outer retinal pigmented epithelium. Multiple types of retinal detachment are well described in other species, though scientific reports distinguishing different types in horses are lacking. Different types include bullous detachment (due to accumulation of fluid between the neurosensory retina and retinal pigmented epithelium), rhegmatogenous detachments (due to tears in the retina), tractional detachments (from fibrinous strands which form following the resolution of inflammation or haemorrhage), or following blunt force trauma (Gilger, 2022). ERU was the most common cause of retinal detachment both in this study and in the previous report (Strobel, *et al.,* 2007) and ERU is the most common cause of accumulation of fluid between retinal layers, but also commonly results in fibrinous traction bands following the resolution of inflammation (Gilger, 2022). It follows that either bullous or tractional detachments are likely to be the most common types in horses, however this information is not yet reported.

This is the first report to describe the clinical presentation, aetiology, diagnostic and examination findings in a UK horse population with retinal detachment. The most frequently reported aetiology was ERU (43.5%), followed by trauma (34.8%), which are findings consistent with a previous study examining a USA hospital population. This cited ERU as a cause in 67.5% of cases, followed by trauma (25%) (Strobel *et al.,* 2007). The proportion of cases due to trauma was relatively higher in this study, potentially reflecting the lower prevalence of ERU in the UK horse population (Malalana *et al.*, 2017).

Detachment manifests clinically as reduced or absent responses to cranial nerve function tests, including menace responses, dazzle reflexes and PLR. Of the reported cases, 8/22 (36.4%) retained a weak PLR, and three of these eight cases retained a dazzle reflex and/or menace response. These three cases were all partial detachments, and hence retained some vision processing ability which explains the residual function. However, 3/22 (13.6%) cases continued to display a weak PLR despite complete retinal detachment. This is possible due to intrinsically photosensitive retinal ganglion cells (ipRGCs) which have the ability to slowly depolarize in response to light stimulus even when detached from the retinal pigmented epithelium and underlying choroid and contribute to pupillary constriction (Markwell *et al.,* 2010). Therefore, the possibility of complete retinal detachment should not be excluded in the presence of a positive PLR, and it should be noted that in partial detachment, positive responses to vision tests can still occur.

Ultrasonography was confirmatory of retinal detachment in 23/23 (100%) of cases in this series, and in 14/23 (60%) was the sole method of diagnosis. This is consistent with previous literature, which found ultrasound essential in diagnosis in 26/46 (56%) of eyes (Strobel, Wilkie and Gilger, 2007). Furthermore, a survey documenting ultrasound abnormalities within equine eyes also found ultrasound to have greater sensitivity at detecting retinal detachment than direct evaluation (Gialletti *et al.*, 2018). However, ultrasound also has the potential to misdiagnose diseases in eyes with poor image contrast, showing only moderate to acceptable agreement with histology for the diagnosis of retinal detachment in one study (Gallhoefer *et al.*, 2013). Consideration of imaging findings in conjunction with direct ophthalmoscopy and the overall clinical picture is warranted before a diagnosis is made.

The common aetiologies of retinal detachment reported in this study are conditions with a high incidence of cataracts and anterior chamber pathology (Gilger, 2010), or in the case of trauma, are likely to present with periorbital swelling and haemorrhage, meaning that visualization of the posterior segment is challenging in most cases. Ultrasonography should therefore be considered in evaluation of severe uveitis and ocular trauma patients where a direct view of the fundus is obscured. This will increase the likelihood of diagnosing retinal detachment and therefore more accurately inform prognosis for vision.

Vitreal debris was a common concurrent finding in this report and can appear similar to retinal detachment on ultrasound examination. Careful differentiation from retinal detachment is required to prevent misdiagnosis, and referral for a second opinion should be sought by the inexperienced practitioner, or if there is any doubt in the interpretation of imaging findings. Vitreal changes can take the form of linear hyperechoic opacities floating within the vitreous, or degeneration which results in point-like echogenicities (Gialletti *et al.*, 2018). The former can be differentiated from retinal detachment by identifying points of insertion of the retina at the optic nerve head and bilaterally at the ora ciliaris, which gives rise to the “seagull wing” appearance (Figure 1b). In contrast, vitreal membranes tend to be thinner and not follow any specific pattern of insertion, which is a key difference from retinal detachment, since almost all complete detachments maintain a fixed point within the fundus (Valentini *et al.*, 2010). Retinal detachments also tend to have increased echogenicity and be less mobile than vitreal membranes (Scotty, 2005). Techniques such as contrast-enhanced ultrasonography have shown to be superior to B-mode ultrasonography in humans and small animals in distinguishing retinal detachment from vitreal membranes (Han *et al.*, 2001; Labruyere *et* *al.,* 2011). However, preliminary work in horses has shown marked inter-jndividual variation and poor reproducibility (Blohm *et al.,* 2020). More work is needed to demonstrate the clinical utility of this technique in horses.

Cataracts, posterior synechiae and vitreal debris were the most common abnormalities found in the ipsilateral eye in unilateral cases of retinal detachment. These are common features of ERU (Gilger, 2022; Malalana *et al.*, 2020) and their frequency in the presence of retinal detachment in this study emphasises the need for thorough evaluation of the fundus in chronic uveitis cases, especially when the eye appears non-visual. In this study, 47.6% of cases of retinal detachment also displayed abnormalities in the contralateral eye, where cataracts and vitreal debris were the most frequently identified findings. This reflects ERU as the most common aetiology for retinal detachment, which is often a bilateral condition (Malalana *et al.*, 2020) but indicates that detailed examination of both eyes in suspect retinal detachment cases is warranted. Retinal detachment occurring without concurrent pathology or an apparent inciting cause is infrequent, occurring in only 3/140 cases in one histologic study of equine ocular disease (Flores *et al.*, 2020).

This report is limited by its retrospective nature and small number of cases. The study population consists of patients presented to a single referral hospital over a 10-year period, which may not be reflective of the wider UK horse population. However, the main findings are consistent with a previous report published from a population presented to two USA referral hospitals over a 7-year period, which provides preliminary evidence that the causes and clinical presentation of retinal detachment do not have the same spatial or temporal variation amongst the global horse population as with other ocular conditions (Matthews and Gilger, 2009). In addition, though the cases recorded had a clinical diagnosis of retinal detachment, histopathological examination in any eyes which were subsequently enucleated would have provided further confirmation. Furthermore, due to the retrospective nature of this study, it was not possible to distinguish between different types of retinal detachment and accurately describe them. This would have added detail to the descriptive findings of this disease and originality to the report.

In conclusion, this study provides original descriptive data pertaining to the clinical presentation, aetiology, examination findings and diagnosis of retinal detachment amongst horses in a UK population. The small sample size precludes firm conclusions, but it appears that common aetiologies and clinical findings are like those previously reported in the USA. Ultrasonography was highly useful for the diagnosis of this condition in this report, and therefore should be considered as part of a thorough ophthalmic examination where direct visualization of the fundus is not possible. Cataracts, vitreal debris and posterior synechiae were common concurrent findings, and so the possibility of retinal detachment should be explored and excluded when these are present in an apparently non-visual eye. The distinction between inflammatory vitreal membranes and retinal detachment should be carefully made, because the presence or absence of the latter determines prognosis for vision, and therefore is crucial to accurately determine.

Declarations

No conflicts of interest to declare.

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Manufacturers Addresses

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Figure Legends

**Figure 1a:** Multiple grey tissue folds are evident floating within the vitreous indicating retinal detachment in this case. This horse presented post-vitrectomy. Irregularity of the pupillary margin is present, consistent with previous episodes of uveitis.

**Figure 1b:** Ultrasonographic appearance of retinal detachment in the same horse. The retina is visible as multiple hyperechoic linear opacities within the vitreous and has the characteristic "seagull wing" appearance, with attachments remaining at the points of insertion at the optic nerve head (arrow) and ora ciliaris (arrowheads).

**Figure 2:** Aetiology of equine retinal detachment in a UK hospital population

**Table 1: Age, gender, breed, eye affected and presenting complaint for all horses.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Case** | **Age (years)** | **Gender** | **Breed** | **Eye affected** | **Presenting complaint** |
| **1** | 10 | Gelding | Pony | R | Bilateral cataracts |
| **2** | 5 | Gelding | Andalusian | R | Cataract |
| **3** | 4 days | Filly | Warmblood | Bilateral | Blindness |
| **4** | 7 | Gelding | Warmblood | Bilateral | Blindness |
| **5** | 17 | Gelding | Welsh C | L | Trauma |
| **6** | 8 | Mare | Warmblood | L | Acute onset cataract |
| **7** | 5 | Gelding | Lusitano | R | Re-exam post-vitrectomy |
| **8** | 9 | Gelding | Welsh x | R | Uveitis |
| **9** | 15 | Mare | Warmblood | L | Abnormal ocular appearance |
| **10** | 10 | Mare | Warmblood | R | Trauma |
| **11** | 15 | Gelding | Haflinger | R | Re-exam post - phacoemulsification |
| **12** | 7 | Gelding | Cob | L | Uveitis |
| **13** | 10 | Mare | Welsh Section A | L | Re-exam post-phacoemulsification |
| **14** | 16 | Mare | Warmblood | R | Bilateral cataracts |
| **15** | 11 | Mare | Cob | L | Abnormal ocular appearance |
| **16** | 6 | Mare | Cob | L | Uveitis |
| **17** | 9 | Gelding | TB x | R | Trauma |
| **18** | 6 | Gelding | Shetland | L | Uveitis |
| **19** | 10 | Gelding | Warmblood | R | Uveitis |
| **20** | 8 | Gelding | TB x | L | Cataract |
| **21** | 11 | Mare | Cob | L | Uveitis |
| **22** | 13 | Mare | Polo | R | Glaucoma |
| **23** | 6 | Gelding | Warmblood | R | Pre-purchase exam |

**Table 2: Aetiology, diagnostic method, eye with retinal detachment and whether complete or partial retinal detachment was present on examination**

|  |  |  |  |
| --- | --- | --- | --- |
| **Aetiology** | **Diagnosis – ultrasound (US) or clinical exam (CE)** | **Eye affected – left (L), right (R) or both (B)** | **Complete (C) or partial (P)** |
| **ERU (n=10) (43.5%)** | US (n=6)  CE/US (n=4) | R (n=4)  L (n=5)  B (n=1) | C (n=8)  P (n=1)  Unknown (n=1) |
| **Trauma (n=8) (34.8%)** | US (n=6)  CE/US (n=2) | R (n=4)  L (n=4) | C (n=6)  P (n=2) |
| **Post-surgery (n=3) (13.0%)** | US (n=1)  CE/US (n=2) | R (n=2)  L (n=1) | C (n=2)  P (n=1) |
| **Glaucoma (n=1) (4.3%)** | US | R | P |
| **Congenital (n=1) (4.3%)** | CE/US | B | C |

**Table 3: Aetiology, ipsi- and contralateral ocular abnormalities recorded in unilateral cases of retinal detachment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Case** | **Aetiology** | **Diagnosis** – **ultrasound (US) or clinical exam (CE)** | **Eye affected – right (R), left (L), or both (B)** | **Right eye abnormalities** | **Left eye abnormalities** |
| 1 | ERU | US | R | Cataract, posterior synechiae | Cataract, vitreal debris |
| 2 | ERU | US | R | Cataract, posterior synechiae, iris rests | None |
| 5 | Trauma | CE/US | L | Cataract | Not recorded |
| 6 | Trauma | US | L | None | Cataract |
| 7 | Post-vitrectomy | CE/US | R | Dyscoria | None |
| 8 | Trauma | US | R | Posterior synechiae, eyelid laceration, hyphaema, aqueous flare, lens subluxation, vitreal debris | None |
| 9 | Trauma | US | L | None | Cataract, posterior synechiae |
| 10 | Trauma | US | R | Periorbital swelling, hyphaema, chemosis, aqueous flare, vitreal debris | None |
| 11 | Post-phacoemulsification | US | R | Anterior chamber fibrin | None |
| 12 | ERU | CE/US | L | Lens subluxation | Not recorded |
| 13 | Post-phacoemulsification | CE/US | L | Vitreal debris | Corneal opacity, vitreal debris |
| 14 | ERU | US | R | Cataract, decreased IOP | Cataract |
| 15 | ERU | US | L | Cataract, leucochoria, vitreal debris | Cataract, posterior synechiae, collapse of anterior chamber, lens subluxation |
| 16 | ERU | CE/US | L | None | Cataract, posterior synechiae, dyscoria, vitreal debris |
| 17 | Trauma | US | R | Eyelid lacerations, hyphaema, corneal ulcer, increased IOP | None |
| 18 | ERU | CE/US | L | Cataract, vitreal debris | Corneal opacity |
| 19 | ERU | US | R | Cataract, posterior synechiae, collapse of anterior chamber, corneal oedema | Horizontal band keratopathy, iris cyst, cataract |
| 20 | Trauma | US | L | None | Cataract |
| 21 | ERU | US | L | Corneal oedema, bupthalmos, increased IOP, iris rest, vitreal debris | Cataract, posterior synechiae, Haab's striae, dyscoria |
| 22 | Glaucoma | US | R | Corneal oedema, vitreal debris | None |
| 23 | Trauma | CE/US | R | Cataract | Focal chorioretinitis |

**Table 4: Aetiology and ocular abnormalities in bilateral cases of retinal detachment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Case** | **Aetiology** | **Diagnosis – ultrasound (US) or clinical exam (CE)** | **Eye affected** | **Right eye abnormalities** | **Left eye abnormalities** |
| 3 | Congenital | CE/US | Bilateral | Corneal ulcer | Corneal ulcer |
| 4 | ERU | CE/US | Bilateral | Cataract, corneal oedema, aqueous flare, collapse anterior chamber, vitreal debris | Cataract, corneal oedema, aqueous flare, collapse anterior chamber, vitreal debris |