

Ophthalmic examination findings in a group of retired racing Greyhounds

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Abstract

Objective To characterize the frequency and types of ophthalmic findings in a group of retired racing Greyhounds.

Materials and methods Complete ophthalmic examinations of both eyes of 100 retired racing Greyhounds were performed. Anterior segment examinations were performed by slit-lamp biomicroscopy. Tear production was measured by Schirmer tear test. Intraocular pressures were obtained by applanation tonometry. The posterior segments were examined by binocular indirect ophthalmoscopy following pharmacologic dilation. A photographic record of abnormalities was obtained whenever possible.

Results Mean tear production by Schirmer tear test was 21 mm/min (range 11–30 mm/min). Mean intraocular pressure by applanation tonometry was 16 mmHg (range 9–28 mmHg). The most prevalent anterior segment findings were cataracts (17% dogs, 11% eyes), corneal degeneration/scarring (6% dogs, 4% eyes), and suspected typical and atypical ‘pannus’ (total 4% dogs, 4% eyes). The most prevalent posterior segment abnormalities were vitreal degeneration (31% dogs, 38% eyes) and chorioretinal degeneration/scarring (7% dogs, 4% eyes). Other findings included anterior chamber vitreal strands, stretched lens zonules, periocular alopecia, a case of mild unilateral chemosis, and a distichium.

Conclusions Ophthalmic abnormalities are not uncommon in retired racing Greyhounds.

Key Words: cornea, Greyhound, lens, retina, vitreous

INTRODUCTION

The author had the opportunity to examine the eyes of a large number of a colony of retired racing Greyhounds over the 3 years preceding this study. The most common reason for presentation was suspected chronic superficial keratitis or ‘pannus’, but a number of other findings were identified, including a conjunctival dermoid, corneal degeneration, cataract, and chorioretinal scarring. These abnormalities prompted this screening study to characterize the frequency and types of ophthalmic findings in retired racing Greyhounds.

MATERIALS AND METHODS

All dogs examined were retired racing Greyhounds currently acting as blood donors as part of a reputable, licensed, veterinarian-run program providing humanely obtained blood products to veterinary practitioners. All dogs had complete blood counts, serum chemistry panels, plasma von Willebrand factor levels, complete blood typing, and thyroid panels performed. Serologic screenings for *Brucella canis*, *Babesia*

canis, *Babesia gibsoni*, *Dirofilaria immitis*, *Ehrlichia canis*, *Rickettsia rickettsii*, *Borellia burgdorferi*, and *Coccidioides immitis* were also performed on each dog. Only healthy dogs of universal blood type (DEA-4), based on these tests and physical examination, were admitted to the colony, with the exception of hypothyroid dogs, which were admitted and placed on maintenance thyroid hormone supplementation. All dogs were surgically sterilized, fed the same commercially available maintenance dog food, and maintained in a closed colony environment.

Complete ophthalmic examinations of both eyes of 100 dogs randomly selected from this colony were performed over 2 days. Examination of the anterior segment by slit-lamp biomicroscopy (SL-15, Kowa Company, Ltd, Tokyo, Japan) was performed first by the author in a darkened room, and findings recorded. Dogs with corneal pathology were marked for later fluorescein staining. Then, all dogs were moved to another room. There, Schirmer tear tests (Schering-Plough, Kenilworth, NJ, USA) were performed, topical proparacaine (Falcon Pharmaceuticals, Ltd, Fort Worth, TX, USA) instilled, and applanation tonometry (Tono-Pen Vet,

Medtronic Solan, Jacksonville, FL, USA) performed, in the order described, on all eyes. Fluorescein staining (BioGlo, Ocularvision, Buellton, CA, USA) was performed on both eyes of all dogs marked during anterior segment examination for staining. Topical 1% tropicamide (Falcon Pharmaceuticals) was then placed for pharmacologic dilation, providing pre-dilation IOP did not exceed 25 mmHg. Fifteen to 30 min later, the dogs were returned to the darkened room where binocular indirect ophthalmoscopy (Keeler Vantage, Berkshire, UK) with a 20-D panretinal lens (Volk®, Mentor, OH, USA) was performed by the author, and findings recorded. Whenever possible, color photography was performed to document abnormalities.

RESULTS

Both eyes of 100 Greyhound dogs were examined. Sixty (60%) were neutered male dogs and 40 (40%) were neutered female dogs. The mean age of examined dogs was 3.33 years (range 2–5 years). Forty-four of 100 dogs originated from racetracks in Arizona, 30 from Oklahoma, 24 from Texas, and two from Kansas. Twenty-five per cent were under treatment for hypothyroidism. No dogs were currently receiving ophthalmic medications.

Mean tear production by Schirmer tear test was 21 mm/min, and ranged from 11 to 30 mm/min. Mean IOP by applanation tonometry of all eyes was 15.9 mmHg, and IOP ranged from 9 to 28 mmHg. Fluorescein dye was placed in both eyes of eight dogs, and three corneas were focally fluorescein positive (1.5% total eyes, 19% tested eyes).

The most prevalent anterior segment finding was cataract, which was identified in 22 eyes of 17 dogs (11% eyes, 17% dogs). Twelve cases were unilateral and five were bilateral. Seventeen of 22 lens opacities were located in the cortex or capsule, three were in the nucleus, and two were located at the nuclear-cortical junction. None had a demonstrable effect on vision. Most were punctate to multifocal punctate. Of the remainder, one dog had bilateral nuclear purulent ('spun wool') cataracts, one dog had mild bilateral diffuse junctional opacities, one dog had a unilateral triangular anterior cortical 'spoke-wheel' opacity, and one dog had an irregular paraxial anterior cortical opacity, which was suspected to be secondary to trauma, based on an adjacent corneal opacity (Fig. 1).

Six dogs (6%) without cataracts had unilateral findings suggesting lens instability. Three eyes (1.5%) had vitreal strands identified in the anterior chamber. Three eyes (1.5%) had mildly, but visibly, elongated lens zonules, suggesting either impending lens subluxation or mild equatorial lens coloboma.

Four dogs (4% dogs) had clinical signs consistent with the immune-mediated ocular condition termed 'pannus.' All cases were bilateral (4% eyes). One dog had only typical signs of chronic superficial keratitis involving fibrosis, vascularization, and pigmentation of the lateral corneas. Another had signs that were strictly atypical and involved depigmentation and hyperemia of the conjunctiva of the leading edge of the third

eyelids. The remaining two dogs had both corneal and third eyelid involvement. Several dogs not included in these data also had isolated, temporally located, perilimbal, dark brown-to-black, episcleral pigmentation, which may indicate early signs of immune-mediated chronic superficial keratitis. In no case was corneal involvement sufficiently axial in location to cause functional visual impairment.

Eight eyes (4%) of six dogs (6%) had corneal opacities not attributable to 'pannus'. Four cases were unilateral and two were bilateral. One dog had unilateral laterally located corneal edema associated with a corneal endothelial scar. The remaining seven eyes had subepithelial/anterior stromal granular opacities suggesting corneal degeneration or scarring. These cases were multifocal, punctate to coalescing, and paraxial in nature, and none appeared to cause vision impairment.

The most prevalent posterior segment abnormality was vitreal degeneration, which was found in 62 eyes of 38 dogs (31% eyes, 38% dogs). Fourteen cases were unilateral and 24 were bilateral. Severity varied from mild peripheral to severe generalized liquefaction. One case of unilateral asteroid hyalosis was identified, and associated with severe unilateral retinal degeneration.

Additionally, the hyaloid vascular channel (Cloquet's canal) was considered prominent in all eyes examined. Two of the previously described focal cataracts were at the site of embryonic hyaloid artery attachment (Mittendorf's dots).

Chorioretinal degeneration or scarring was identified in eight eyes of seven dogs (4% eyes, 7% dogs). Five cases were focal unilateral scars. One bilateral case of multifocal chorioretinal scarring was identified. A single case of severe unilateral retinal degeneration was identified (Fig. 2). Functional visual impairment was not suspected in any case. Unilateral absence of menace response and unilateral blindness was confirmed on examination of the case with unilateral severe retinal degeneration only.

Sporadic findings included a distichium and case of mild unilateral chemosis (0.5% eyes, 1% of dogs each). Additionally, many dogs had regions of cicatricial alopecia and nonpruritic hair thinning involving multiple sites, including the periocular region. These lesions were not numerically documented because of difficulty in precisely defining the periocular region and degree of hair loss necessary to qualify inclusion.

DISCUSSION

Greyhound dogs appear to have intraocular pressures and tear production comparable to those of the species as a whole.^{1,2} There are few previous reports of ophthalmic abnormalities in Greyhound dogs. Among the conditions reported are persistent hyperplastic primary vitreous (PHPV),³ retinal degeneration/atrophy,^{4,5} and chronic superficial keratitis or 'pannus'.⁶

No cases of PHPV, such as previously described in a Greyhound,³ were identified within this colony. However, the hyaloid vascular channels (Cloquet's canals) were easily identified in all eyes, and their width and prominence varied



Figure 1. External photograph of an irregular paraxial anterior cortical lens opacity in the left eye of a greyhound dog, visible by retroillumination, and suspected to be secondary to trauma based on an adjacent corneal opacity (not visible in this photograph).

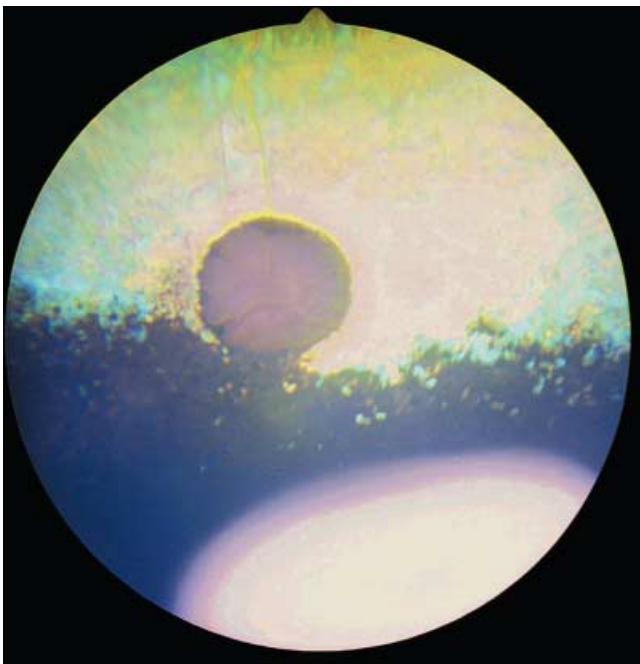


Figure 2. A fundus photograph reveals severe unilateral retinal vascular attenuation and tapetal hyper-reflectivity consistent with advanced retinal degeneration.

dramatically. Additionally, anterior hyaloid vascular remnants were identified unilaterally on the posterior lens capsules of two dogs. Persistent hyperplastic primary vitreous is due to hyperplasia and failure of resorption of the developmental

primary vitreous.³ Therefore, it is possible that these hyaloid vascular components retained postnatally may represent mild forms on a continuum of this condition. On the other hand, clinical PHPV appears to occur only sporadically, without a clear genetic predisposition, in the Greyhound, unlike certain other breeds, including the Doberman Pinscher and Miniature Schnauzer.^{7,8}

A single case of advanced retinal atrophy was identified in this group. It was unilateral and might have resulted from previous spontaneous or traumatic retinal detachment. No cases of bilateral disease consistent with progressive retinal atrophy or degeneration (PRA), such as previously reported in the Greyhound,⁴ were identified. Although Greyhound PRA is considered an early onset form, this was a young population (mean 3.33 years; range 2–5 years), and some of these dogs might have been too young to exhibit clinical or ophthalmoscopic signs. Electroretinography, which might have identified subclinical PRA, was not performed. The remaining cases of retinal degeneration in this group of dogs were focal or multifocal lesions consistent with chorioretinal scarring. In horses, scattered ‘birdshot’ chorioretinal scars are common.⁹ They are thought to represent previous episodes of systemic inflammatory disease with secondary uveal tract involvement.¹⁰ Medical care for racing dogs may be less meticulous than for the average pet dog. Combined with crowded conditions, this may make infectious disease more common in this population. Additionally, many racing Greyhounds have raw meat as part of their diet, and are not on a regular deworming program, which would be expected to lead to an increased prevalence of parasitic disease. Although normal larval migration does not involve the eye, aberrant migration to the eye (ocular larval migrans) may involve the posterior segment of the eye and result in retinal scars. Small inactive retinal lesions fewer than 20 per eye are considered to have inconsequential visual effects in the horse.^{9–11} It is not clear whether this ‘rule of thumb’ applies to the smaller canine eye. However, none of these dogs, including one dog with bilateral multifocal lesions greater than 20 in number, had a decreased menace response, or was suspected by its handlers of having functionally diminished vision. Objective visual acuity testing is problematic in domestic animal species, and was not attempted here.

‘Pannus’ is seen most commonly in the German Shepherd dog, but has also been reported in the Greyhound.^{6,12} Three forms have been described in the German Shepherd. The first, and most common, is a chronic superficial keratitis resulting from an autoimmune lymphoplasmacytic attack on the cornea. In this form, varying degrees of nonulcerative superficial corneal pigmentation, vascularization, and fibrosis are seen.¹² The corneal opacity usually begins temporally, and progresses nasally without treatment to cause visual obstruction.¹² Two atypical forms occur less commonly: a third eyelid depigmenting blepharitis form (‘plasmoma’) and a medial canthal erosive syndrome. The typical corneal and atypical third eyelid forms were identified in this group of Greyhounds, both alone and combined within the same

animal. This is in contrast to the previous report of isolated corneal disease in two Greyhounds.⁶ In none of the cases here was axial corneal involvement present, which suggests that the condition in the Greyhound may be less severe than in the German Shepherd dog. Pannus is thought to be initiated or exacerbated by ultraviolet light exposure.¹² The current conditions of these dogs involve minimal sunlight exposure, which may also partially explain the lack of severity. However, it also may not be coincidental that of the four affected dogs, three were from tracks in warm arid southern states (Arizona and Texas).

Five dogs not diagnosed with 'pannus' had anterior stromal granular corneal opacities consistent with corneal degeneration. Their appearance was scattered or perilimbal in nature, and did not closely resemble corneal scars. Association with adjacent corneal vascularization was variable. It was considered that the corneal opacities might have been due to metabolic derangements due to hypothyroidism (i.e. hypercholesterolemia), but none of the dogs with corneal degeneration was diagnosed with hypothyroidism. Similarly, the corneal opacities might have represented the leading edges of previous episodes of active chronic superficial keratitis; however, these dogs were not receiving any immunosuppressive medications, and spontaneous resolution of pannus was considered unlikely. Previous episodes of other ocular disease, such as anterior uveitis, causing secondary corneal damage could not be ruled out. An inherited corneal dystrophy was also possible, but these lesions lacked characteristics typical of corneal dystrophy, including consistent location, bilaterally symmetrical appearance, and lack of corneal vascularization. Superficial keratectomies with submission of the excised corneal opacities for histopathologic analysis may provide useful information to further clarify this condition.

Vitreous degeneration has not been reported previously in the literature for the Greyhound, although it has been recently recognized by the Genetics Committee of the American College of Veterinary Ophthalmologists (ACVO) as an ocular disease presumed to be inherited in the Italian Greyhound, based on data obtained through Canine Eye Registry Foundation (CERF) examinations.¹³ It was the most common abnormality noted in this colony of Greyhounds (31% dogs, 38% eyes). Most cases were identified as variations of relucency within the vitreous body, representing regions of liquefaction. As such, these probably had minimal effect on vision. A few cases were identified by vitreal strands or other opacities, including a single instance of profound unilateral asteroid hyalosis. Asteroid hyalosis is a condition of suspended calcium-lipid complexes within the vitreous. Suggested causes include aging,¹⁴ systemic disease,¹⁵ and ocular disease. This case was consistent with the latter, as the affected dog was only 3 years of age, the hyalosis was associated with severe unilateral retinal degeneration, and systemic metabolic diseases were ruled out by a screening blood panel. Although vitreal degeneration itself is relatively asymptomatic it is significant, as it may predispose affected individuals to retinal detachment.

There is no reason to believe that vitreal degeneration contributes to the development of lens instability, but it can help to diagnose this condition. The presence of vitreous within the anterior chamber, identified in three dogs of this colony of Greyhounds, requires simultaneous vitreal syneresis and lens zonule breakdown. An additional three dogs had visibly stretched lens zonules, identified following pharmacologic dilation. Together these findings suggest a predisposition to lens luxation in Greyhounds not previously reported.

The second most commonly reported ophthalmic abnormality in this group of Greyhound dogs was cataract (17% dogs, 11% eyes). In spite of this high frequency, most of the lens opacities identified probably had minor visual effects, owing to their focal to multifocal punctate presentation, and were not expected to progress. One anterior cortical cataract was suspected to have arisen from trauma based on an adjacent corneal opacity. The athletic and sometimes violent nature of racing and training, commonly unneutered condition, and crowded housing conditions of racing Greyhound dogs may predispose to trauma. The etiology of the remainder of the cataracts was uncertain. Planned matings or pedigree analysis are indicated to prove or disprove a hereditary basis.

Of the previously reported ophthalmic conditions of the Greyhound, only a single case of clinical retinal degeneration and four cases of 'pannus' were seen in this group. Vitreal degeneration and minor lens opacities were commonly identified. Less common findings included vitreal strands in the anterior chamber, stretched lens zonules, corneal degeneration, retinal scars, periocular alopecia, mild unilateral chemosis, and a distichium.

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