By: Natasha Mitchell MVB CertVOphthal MRCVS
Article written originally for UK Vet in 2008

Extraocular polymyositis

Extraocular polymyositis (EOM) is a relatively uncommon condition of dogs, of which there are limited reports in veterinary literature. Dr. David Williams from Cambridge University recently published an article on 37 cases from multiple centres (see reference below). The only other case series in the literature is a review of a series of 35 dogs reported by Dr David Ramsey et al, in 1995. In 2000, Allgoewer et al reported on 10 dogs with extraocular muscle myositis and restrictive strabismus had a different clinical presentation and may represent a chronic stage of EOM, or may represent a different syndrome. Of the 200 cases of canine inflammatory myopathies reviewed by Evans et al in 2004, only two cases had EOM.

Extraocular polymyositis affects larger breed dogs, among which the Golden retriever is over-represented. Affected dogs are usually six to twenty-four months old, and females are most frequently affected.

No other species has been reported with the condition in the literature. Extraocular myositis is a common feature of Graves disease in humans, an autoimmune condition of the thyroid gland characterised by goitre, exophthalmos, eyelid retraction and areas of 'orange-peel' skin, first discovered in 1835 by an Irish doctor from Dublin named Robert James Graves.

Three cases of EOM presented to the author between May and August 2007 (see table 1). Each was a young (six months to one year old) female entire Golden retriever, that had received routine vaccinations, worming and flea prevention at appropriate times. Clinical signs had been present for four days to two months prior to examination, and the onset was acute in each case. General physical exam was unremarkable with the exception of the ocular exam. Each dog presented with varying degrees of lateral strabismus (exotropia) affecting both eyes along with exophthalmos (moderate in the first two cases, marked in the third case). All had conjunctival hyperaemia, and the third case had marked chemosis. The nictitating membranes were in normal positions and were mobile. The condition appeared painless and the animals were in very good health. Treatment with immunosuppressive doses of prednisolone at 1.1mg/kg twice daily for three weeks was instigated, followed by a tapering dose over the following two months. Response to treatment varied, with the best response from the dog with a four day history, and the worst from the dog with a two month history. At follow-up eleven to fourteen months later no relapses were reported.

On presentation	Case 1	Case 2	Case 3
Age	6 months	12 months	12 months
Breed	Golden retriever	Golden retriever	Golden retriever
Sex	Female	Female	Female
Neutered?	No	No	No
No of days affected prior to presentation	4	60	28
Previous stressor?	None known	Coincided with first season	None known
Exophthalmos	Yes, mild	Yes, mild	Yes, pronounced
Exotropia	Yes	Yes	Yes
Chemosis	No	No	Yes, marked
Conjunctival hyperaemia	Mild / moderate	Mild / moderate	Marked
STT	L 30 R 24	L 24 R 21	L 28 R 27
Blood results	Normal haematology Normal biochemistry apart from mildly elevated cholesterol No exposure to Toxocara or Neospora	None done	Normal haematology Normal biochemistry apart from low basal T4, raised cholesterol
Treatment	1.1mg/kg prednisolone bid for 21 days, gradually tapered giving a total of 12 weeks of treatment	1.1mg/kg prednisolone bid for 21 days, then 1.1mg/kg sid for 21 days. Became lethargic – changed to azathiaprine 50mg sid for 3 weeks and then tapered over the next 5 weeks	0.9mg/kg prednisolone bid for 21 days, gradually tapered giving a total of 12 weeks of treatment
Outcome	No relapse (fourteen months)	A slight exotropia remained when focusing on near objects	No relapse (eleven months)

Table 1. *Summary of three cases of extraocular polymyositis presented*

Figure 1: *Case 1, a six-month old female entire Golden retriever with a four day history of exophthalmos, epiphora and scleral show medially due to exotropia.*

Presenting signs typically include a painless, rapidly acquired bilateral exophthalmos, sometimes with lateral strabismus and apparent eyelid retraction, which results in a very characteristic "startled" expression. Conjunctival hyperaemia and/or chemosis are frequently a feature. Ramsey et al reported fundus changes in some cases, with vascular tortuosity, focal retinitis and papilloedema. This was not found in the three cases discussed, although typical mild vascular tortuosity commonly found in Golden retrievers was present in one of the dogs examined. The affected animals are normally systemically well. A previous stressor event is suspected in 30-43% of cases, such as oestrus, surgery or attending a boarding kennel. 17% have some visual disturbance (Ramsey et al 1995). There are some reports of the condition being asymmetrical, or that there is uneven involvement of the extraocular muscles affected.

Diagnosis is based on the characteristic clinical signs along with signalment. Imaging studies may be carried out to confirm diagnosis although this is not usually necessary or appropriate, given the classical presenting signs. Imaging results may be supportive of the diagnosis but definitive diagnosis would require histopathology. B-mode ultrasound with 7.5mHz probe or greater shows a diffuse increase in echogenicity of the extraocular muscles consistent with swelling (see Figure 7). MRI would also confirm the structures involved. A forced duction test under general anaesthesia would distinguish mechanical stricture from nerve problems to the extraocular muscles. Biopsy of the extraocular muscles may be carried out and is discussed below.

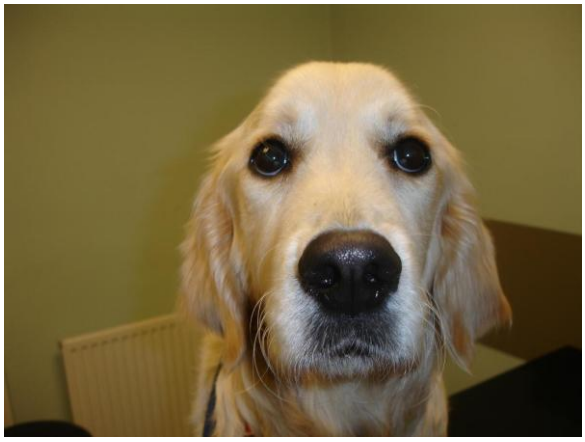

Figure 2: *Case 1 five weeks after treatment with prednisolone at 1.1mg/kg twice daily for three weeks and then 1.1mg/kg once daily.*

The main differential diagnosis is eosinophilic myositis of the masticatory muscles (MMM). This condition occurs principally in young German Shepherd dogs and Weimaraners, but has also been reported in the Golden retriever and Labrador retriever. Both MMM and EOM can present with exophthalmos. In the acute phase of MMM, swelling of the masticatory muscles (temporalis and pterygoid muscles) can displace the globe forward because of the absence of a bony

orbital wall laterally. In the chronic phase of MMM, atrophy of these muscles can cause enophthalmos. EOM can cause exophthalmos and strabismus due to inflammation of the extraocular muscles. There are however key differences in the presentation of both syndromes. EOM is typically non-painful, and protrusion of the third eyelid is not a feature. In the case of MMM, pyrexia and anorexia typically occur. There is also protrusion of the nictitating membrane, episcleral congestion and possible exposure keratitis, depending on the chronicity. The jaw is typically very painful on opening.

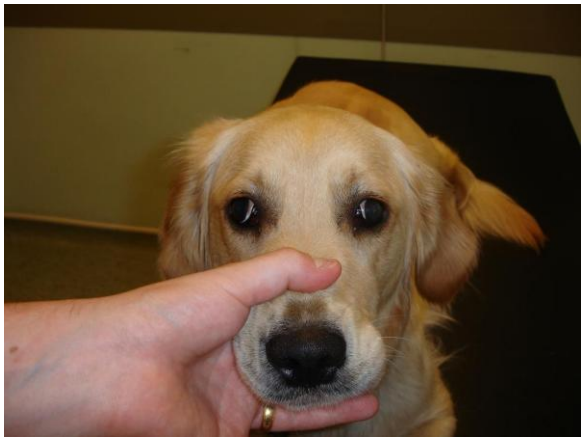

Figure 3: *Case 2, a twelve-month-old female entire Golden retriever with a two month long history of exophthalmos and lateral strabismus (exotropia).*

Both EOM and MMM are focal inflammatory myopathies. An important difference that makes the conditions distinct from each other is the fact that extraocular muscles are derived from a different embryological origin (derived from mesoderm) than masticatory muscle (derived from somitomeres in the first branchial arch). The masticatory muscles are innervated by the Trigeminal nerve and contain a unique type 2M myofibre. Although diagnosis is reached in most cases by clinical signs alone in both EOM and MMM, muscle biopsies may be preserved in formalin and submitted for histopathology, and a second biopsy may be frozen and submitted for immunocytochemical assay. The muscles of mastication are relatively accessible for biopsy. The extraocular muscles are much smaller and more difficult to biopsy due to their location. Therefore this procedure is normally limited to specialist centres. It is not required in many cases if the presenting signs are classical, but some clinicians may opt for histopathology to obtain a definitive diagnosis. In typical muscle sections affected with EOM, histopathology shows myonecrosis with mononuclear infiltrate of CD3+ T-lymphocytes and occasional macrophages in extraocular muscle bellies. Immunocytological assay demonstrates autoantibodies against type 2M myofibres in the case of MMM, but these are not present in extraocular muscle.

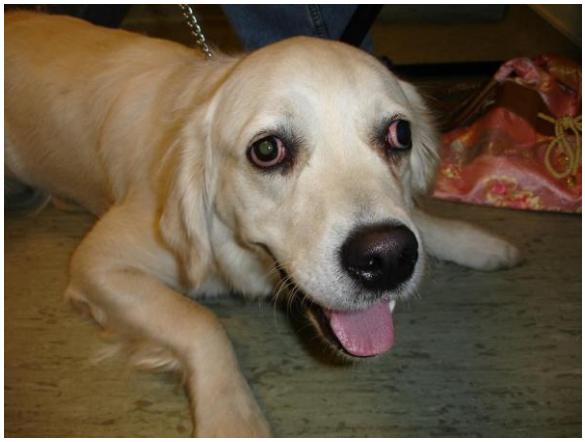

Figure 4: *Case 3, a twelve-month old female entire Golden retriever with a one month history of a waxing and waning exophthalmos. The exophthalmos was marked and there was chemosis with conjunctival hyperaemia.*

The inflammatory nature of the affected extraocular muscles and excellent

responsiveness to steroids suggests an immune-mediated basis for the myositis. Swelling of the extraocular muscles restricts globe movement resulting in strabismus. The inflammation is localized to the extraocular muscle group, with the retractor bulbi muscle being the only unaffected extraocular muscle.

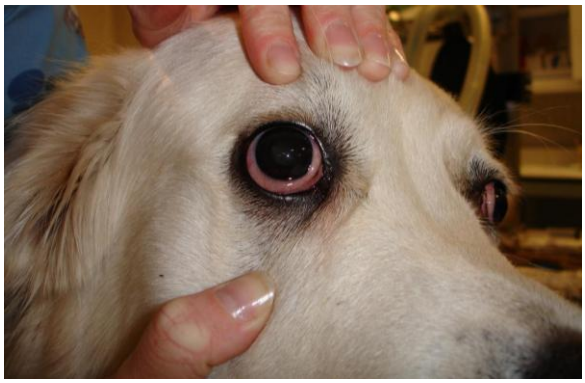

Figure 5: *A close-up of the right eye of case 3 showing marked chemosis and conjunctival hyperaemia.*

Treat using immunosuppressive dose of corticosteroids, which can be gradually tapered after three weeks, depending upon response. Ramsey (1995) reported 57% relapse rate if a dose less than 1.1mg/kg bid was tapered before 3 weeks. Azathioprine can be used when the corticosteroids steroids are contraindicated or unsuitable for the patient.

Early treatment carries a good prognosis and there may be no permanent effects. Prolonged swelling of affected muscles may result in fibrosis leading to enophthalmos and pronounced strabismus which could hinder vision. The resultant restrictive extraocular myositis may be unilateral or bilateral and may be severe enough to warrant surgical correction (Allgoewer et al, 2000), to restore globe position and improve vision. However as mentioned in the introduction, the ten cases in this series were predominantly not Golden retriever dogs, and those cases may represent a distinct disease entity rather than being clearly a sequel to EOM in every case.

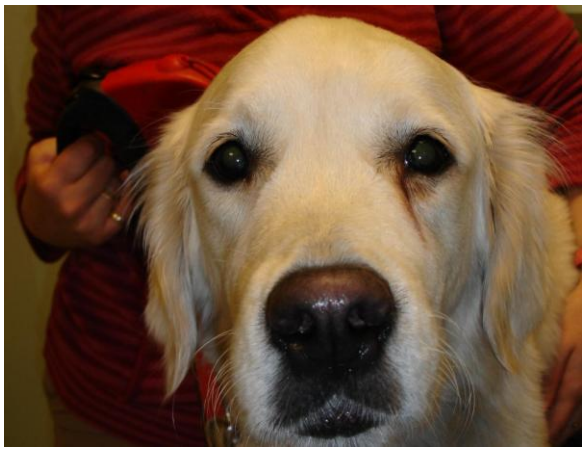

Figure 6: *Case 3 four weeks after starting treatment with 1.1mg/kg of prednisolone twice daily and topical prednisolone acetate 1% eye drops (Pred forte, Allergan). The chemosis and enophthalmos had completely resolved. A mild exotropia remained when she focused on close objects.*

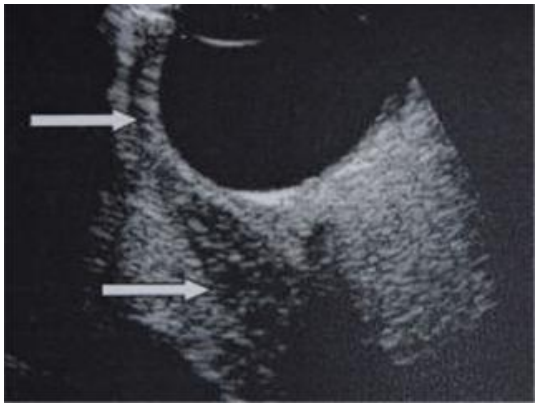

Figure 7: *An ultrasound image of a globe of a one-year-old female neutered Golden retriever. The arrows are demarcating the lateral borders of an enlarged hypoechoic lateral rectus muscle. Photograph courtesy of James Oliver, Davies Veterinary Specialists.*

No recurrence occurred in the three cases above after eleven to fourteen months. Williams did not report any recurrences in his cases series although this was not investigated. However Ramsey reported a high rate of recurrence with subsequent physiologic stressors (heat cycles, boarding at kennels, etc) being implicated as triggers, and therefore monitoring would be advised.

In summary, EOM is a bilateral condition primarily affecting young dogs, with an over-representation of female entire Golden retrievers. The clinical signs of a 'startled' expression with bilateral exophthalmos and strabismus can allow an immediate diagnosis to be made. For this reason, further diagnostic tests are rarely warranted. Occasionally ultrasound examination is carried out, which shows characteristic swelling of the extraocular muscles. Treatment with immunosuppressive doses of corticosteroids or azathioprine usually results in rapid resolution of the clinical signs, although the dogs need to be monitored for relapses.

References:

Allgoewer I, Blair M, Basher T, Davidson M, Hamilton H, Jandeck C, Ward D, Wolfer J and Shelton GD (2000) Extraocular muscle myositis and restrictive strabismus in ten dogs. *Veterinary Ophthalmology* **3**, 21-26.

Carpenter JL, Schmidt GM, Moore FM, Albert DM, Abrams KL and Elner VM (1989) Canine bilateral extraocular polymyositis. *Veterinary Pathology* **26**, 510-512.

Evans J, Lavesque D and Shelton GD (2004) Canine inflammatory myopathies: A clinicopathologic review of 200 cases. *Journal of Veterinary Internal Medicine* 18(5): 679-691.

Mitra S (1998) Eosinophilic myositis of the extraocular muscles. A case report. *Tierarztl Prax Ausg K Klientiere Heimtiere* **26(5):** 336-340.

Ramsey DT, Hamor RE, Gerding PA and Knight B (1995) Clinical and immunohistochemical characteristics of bilateral extraocular polymyositis of dogs. *Proceedings of the Scientific Meeting of the American College of Veterinary Ophthalmologists* **26**, 130-132.

Williams DL (2008) Extraocular myositis in the dog (2008). *Veterinary Clinics Small Animal Practice* **38,** 347-359.