

# **Retrobulbar Diseases in Dogs and Cats**

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The orbit in the dog and cat is composed of a bony fossa created by the lacrimal, maxillary, zygomatic, frontal, sphenoid and palatine bones. This space contains the globe and a host of other tissues both related and unrelated to the function of the globe, including muscles (extraocular muscles, smooth muscle and the medial pterygoid muscle), fat, nerves, connective tissue, glandular tissue (lacrimal and zygomatic salivary gland) and blood vessels. It is important to note that the floor of the orbit in dogs and cats is comprised of soft tissue. As such, the orbit is closely associated with the oral cavity and is vulnerable to extension of dental or other oral disease.

The most common clinical sign of orbital disease is abnormal globe position (most commonly exophthalmos). Other common signs include third eyelid elevation, globe deviation, reduced/absent retropulsion and corneal exposure. Retrobulbar disease can be challenging to diagnose and treat. The majority of cases can be broadly classified as either inflammatory, neoplastic or traumatic in origin (with a few rare anatomical anomalies). For definitive diagnosis and treatment, advanced imaging may be required.

## **Inflammatory disease**

- The hallmarks of orbital inflammatory disease include:
- Acute presentation
- Often associated with pain (ie on manipulation of the mandible)
- May be associated with pyrexia, leukocytosis
- May be bilateral

## **Orbital cellulitis/abscess**

Orbital abscesses are often acute in onset, unilateral, and associated with marked exophthalmos, third eyelid elevation, ocular discharge and globe deviation. Corneal exposure and desiccation, episcleral congestion and mucoid discharge are common. Anterior displacement of the fundus may be noted on fundoscopic exam. Significant pain is often noted on attempted manipulation of the mandible. Pyrexia and leukocytosis are common findings. Close evaluation of the soft tissue caudal to the ipsilateral second maxillary molar may reveal a notable swelling. In multiple retrospective studies the average age of dogs with orbital abscessation was less than that of orbital neoplasia. The underlying cause is often unidentified. Penetrating trauma through the oral mucosa or conjunctiva, dental disease, infection of the zygomatic salivary gland, penetrating foreign bodies or hematogenous seeding of bacteria are proposed mechanisms. *Staphylococcus* spp, *E. coli*, *Pasteurella multocida*, *Bacteroides* spp and *Clostridium* spp have all been identified on culture of orbital abscesses, although bacterial cultures are occasionally negative. A tentative diagnosis can be reached through clinical examination and confirmed with orbital ultrasound, CT or MR. Treatment includes transoral lancing (+/- antibiotic lavage), broad spectrum systemic antibiotics, systemic anti-inflammatories and topical lubrication. In a 2009 retrospective study evaluating aerobic culture and sensitivity results of material isolated from orbital abscesses, mixed infections were common and in dogs, antibiotic sensitivity to amikacin, ceftiofur, gentamicin, imipenem, ticarcillin and trimethoprim-sulfamethoxazole was high, while sensitivity to ampicillin, clindamycin, erythromycin and penicillin was low. Bacteria isolated from the orbit of felines did not exhibit a high degree of antibacterial resistance (Wang, et al, 2009). A temporary tarsorrhaphy is often recommended to prevent exposure keratitis while the swelling resolves. Inflammation caused by an unidentified tooth root abscess or foreign body is likely to recur. The prognosis is generally good, although vision loss can result from optic nerve damage caused by severe exophthalmos.

## **Mucocele/sialocele & salivary retention cysts**

Mucoceles result from obstructed drainage of saliva (sialocele) or tears (mucocele) from the zygomatic salivary gland or lacrimal gland, respectively. The most common cause of either is suspected to be trauma resulting in obstruction of the salivary or lacrimal duct. Saliva or tears back up and eventually escape the duct system, resulting in a fibrosing, inflammatory response that can result in severe, often acute orbital cellulitis with clinical signs often mirroring orbital abscessation. A salivary retention cyst is also related to obstructed salivary flow through the salivary duct system, however retention cysts are often caused by oral disease resulting in cystic dilation of the zygomatic salivary duct (without fluid escape from the duct system). Orbital ultrasound, CT or MR can be used to confirm a clinical suspicion of a mucocele or retention cyst. Treatment of orbital mucoceles/sialoceles is similar to that of orbital abscesses. The fluid that is drained from the orbit is often viscous and clear to yellow in color. Surgical excision of the affected gland is often recommended to prevent recurrence of mucoceles, and treatment of underlying dental disease is necessary to prevent recurrence of salivary retention cysts.

### **Masticatory muscle myositis (MMM)**

Masticatory muscle myositis often results in acute-onset bilateral exophthalmos with associated facial swelling. Inappetence, pyrexia and pain on manipulation of the mandible are common clinical findings. The disease is most commonly reported in the German Shepherd Dog, with less commonly affected breeds including the Weimeraner, Labrador and Golden Retriever. Exophthalmos is the result of inflammation of the medial pterygoid muscles that line the floor of the orbit. Inflammation of the masseter and temporalis muscles result in further facial swelling. A peripheral leukocytosis and eosinophilia may be present in the acute stage. The pathogenesis of MMM involves auto-antibody production against type 2M muscle fibers, more specifically the myosin binding protein-C, which is present in all masticatory muscles but the diaphragmaticus. Diagnosis can be achieved via a positive 2M antibody test or temporal muscle biopsy. Treatment involves immunosuppressive therapy. Chronic inflammation may result in masticatory muscle fibrosis, resulting in enophthalmos, restricted globe mobility and an inability to open the jaw.

### **Extraocular muscle myositis**

Extraocular muscle myositis results in acute-onset bilateral exophthalmos. An important distinguishing feature of this disease is the absence of globe deviation or third eyelid elevation. Pain is usually not present. The Golden Retriever is predisposed and the disease is often diagnosed in young dogs. Definitive diagnosis requires histopathology of an extraocular muscle but can be presumptive based on clinical signs. Orbital ultrasound, CT or MR will reveal EOM swelling. Although the disease is immune mediated and is not often associated with an underlying infectious etiology, testing for *Neospora*, *Toxoplasma* and *Leishmania* are recommended to rule out infectious myositis. Treatment involves immunosuppression or antimicrobials where indicated. Chronic inflammation of the extraocular muscles can result in fibrosis with secondary enophthalmos and strabismus.

### **Orbital neoplasia**

- The hallmarks of orbital neoplasia include:
- Chronic, often insidious presentation
- Generally not associated with pain
- Generally not associated with pyrexia or leukocytosis
- Signalment may be suggestive

Orbital neoplasia can arise from any of the aforementioned structures within the orbit, structures surrounding the orbit, or from distant metastasis. Although signs of pain can be present, orbital neoplasms are most commonly associated with chronic, progressive nonpainful globe displacement. Third eyelid elevation is common. Orbital neoplasia involving the nearby nasal sinuses may be associated with nasal discharge, sneezing or decreased nasal airflow. The most common tissue of origin varies between studies, however carcinomas, adenocarcinomas, osteosarcomas, squamous cell carcinomas and meningiomas appear to top the list.

Fibrosarcomas, mastocytomas, peripheral nerve sheath tumors and lymphosarcoma have also been reported, among others. Diagnosis of orbital neoplasia generally requires imaging (ultrasound, CT, MR) with histopathologic or cytologic analysis of a tissue/FNA sample. If a solitary mass is suspected based on staging, complete excision may be curative via orbitotomy and resection or via exenteration. Adjunctive radiation or chemotherapy may be indicated based on the tumor type and degree of extension/metastasis. Unfortunately, the majority of orbital tumors in the dog and cat are malignant. Reported mean survival times in retrospective studies have ranged from 1 to month to 8.6 months in the cat and 8.6 to 13 months in the dog. Surgical and adjunctive therapy have been shown to increase survival time in multiple studies.

### **Trauma**

Traumatic fracture of the zygomatic, maxillary or frontal bone often results in globe displacement, with either enophthalmos or exophthalmos, third eyelid elevation, strabismus and lagophthalmos. Orbital emphysema or hematomas may result. CT is often required for localization of fractures and identification of other involved structures. Surgical repair may or may not be indicated based on the degree of displacement and ocular involvement.

### **Proptosis**

Proptosis is almost invariably the result of trauma, resulting in anterior displacement of the globe. The eyelids themselves become trapped posterior the equator of the globe, which in conjunction with marked orbital swelling prevent spontaneous repositioning. Proptosis is often accompanied by episcleral hemorrhage, lateral strabismus, corneal desiccation and often, vision loss. Brachycephalic breeds are predisposed due to shallow orbits. Treatment involves immediate globe repositioning with temporary tarsorrhaphy suture placement, systemic anti-inflammatories, systemic antibiotics and topical lubrication. On average, only about 20% of proptosed eyes maintain vision after repositioning. Dogs that are visual at presentation, have minimal globe displacement and are brachycephalic have the best prognosis for vision. Poor prognostic indicators for vision in the dog include a dolichocephalic facial conformation, hyphema and a lack of consensual pupillary light reflex to the unaffected globe. Resting pupil size is not a good indicator of visual prognosis alone. Globes with more than 2 avulsed extraocular muscles have a poor prognosis for globe salvage and

should be enucleated. Owners should be counseled regarding possible long term sequelae of proptosis including blindness, lateral strabismus, corneal anesthesia and secondary neurotrophic keratitis, KCS, phthisis bulbi and glaucoma. In the cat, globe proptosis is generally associated with severe trauma and most commonly requires enucleation.

### **Vascular anomalies**

Exophthalmos has been reported in dogs as the result of orbital varices and arteriovenous fistulas. These are extremely rare and can be either congenital or acquired, generally via trauma. The most common presenting clinical sign is episodic, nonpainful exophthalmos that is worsened when the head is below the level of the heart. An audible murmur may be auscultated over the orbit in cases of A-V fistula. Definitive diagnosis requires dynamic contrast CT or MR angiography. Treatment is surgical.

### **References**

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