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DIAGNOSIS AND TREATMENT OF GLAUCOMA

Glaucoma is a group of diseases that cause loss of retinal ganglion cells and optic nerve demyelination, resulting in rapid loss of vision. A common clinical sign is an elevation in intraocular pressure (IOP). In addition to loss of vision, significant discomfort can also be present if the IOP is elevated.

Clinical signs of acute glaucoma include diffuse corneal edema, mydriasis, conjunctival and sclera hyperemia and loss of vision. Three things to consider in glaucoma:
Is it glaucoma? Measure the IOP. Normal IOP is between 10 and 20 mm Hg. A persistent difference between the two eyes is significant.
Is it primary or secondary? Primary glaucoma is most commonly seen in cocker spaniels, basset hounds, beagles, poodle and the arctic breeds, but many other breeds are also predisposed. It is a hereditary malformation of the iridocorneal angle that progressively deteriorates during life. It is bilateral, and predisposes the other eye to glaucoma in the future. Both eyes need to be treated. The prognosis for long term vision is poor. Secondary glaucoma is secondary to another disease in the eye. Common examples are chronic uveitis, retinal disease, intraocular neoplasia, luxated lens. Treatment and prognosis depends on the etiology.
Is it acute or chronic? If it is acute, potential for return of vision exists. In acute glaucoma, animals need to be treated VERY aggressive to give them the best possible chance for return of vision. Chronic glaucoma has destroyed all potential for vision in the eye. The globe is typically enlarged, corneal striae can be present, the lens can be (sub) luxated, the optic nerve is demyelinated (small, round and dark) and cupped and the fundus is diffusely hyperreflective. These eyes need to be managed surgically

Glaucoma medications:
Glaucoma medications reduce the intraocular pressure by reducing the production of aqueous humor, increasing the outflow of aqueous humor, or a combination or both. They are either administered systemically, or topically

Systemic therapy:
Osmotic agents reduce intraocular pressure by increasing plasma osmolality which results in diffusion of water from the intraocular fluids back into the plasma. An intact blood aqueous barrier is needed to lower the intraocular pressure and water needs to be withheld for 4 hours after administration of the osmotic agent.
Intravenous mannitol is the most commonly used osmotic agent in treatment of acute glaucoma. Mannitol may be used in diabetics, but should be used with caution in patients with cardiac disease or renal insufficiency. The usual dose is 1-2 gram/kg given slowly over 20-30 minutes.
Oral glycerin has the advantage of not requiring intravenous access, but the hypotensive effect can be unpredictable and vomiting may occur. It should be avoided in diabetic patients.

Carbonic anhydrase inhibitors (CAI)
Carbonic anhydrase inhibitors decrease the production of aqueous humor. Common side-effects include metabolic acidosis, hypokalemia and gastrointestinal problems such as anorexia, vomiting and diarrhea. Respiratory side-effects include increased respiratory effort and panting. Weakness and ataxia are uncommon side-effects. The most commonly used oral CAI is methazolamide at a dose of 2 mg/kg BID to TID. Although dose ranges of up to 10 mg/kg BID to TID have been reported, side-effects are common at higher doses

Topical glaucoma medications:
Carbonic anhydrase inhibitors:
2% dorzolamide. This is a commonly used medication in the management of glaucoma in dogs and cats. It is usually used BID to TID and is usually well tolerated. Potential side-effects include burning/stinging upon application to the eye.
1% brinzolamide. Brinzolamide may be better tolerated than dorzolamide, but appears less effective in cats.

ß-blockers
ß-blockers reduce the intraocular pressure by reducing the production of aqueous humor.

0.25% or 0.5% timolol maleate. This is a non-selective ß-blocker. It is a commonly used medication and is part of the commercial product "Cosopt" (2% dorzolamide/0.5% timolol maleate). It should be avoided in cats with asthma and dogs and cats with cardiac disease.
Betaxolol. This is a ß1-selective ß-blocker that lacks the cardiovascular effects of timolol maleate. Its effect on IOP has received little study in veterinary patients

Prostaglandin analogues
They decrease intraocular pressure by increasing uveoscleral outflow and decreasing production of aqueous humor. Pronounced miosis is an effect of the medication. Its use should be avoided in eyes with uveitis and anterior lens luxation. The efficacy of these drugs is questionable in cats..
0.005% latanoprost (Xalatan®). This is a highly effective medication in the treatment of canine glaucoma. It may also be used as an emergency medication in acute primary glaucoma. The IOP reduction may be rapid enough to avoid having to use intravenous mannitol.
Travatan (travoprost) is also used to treat primary glaucoma in dogs.
Lumigan (brimatoprost) is uncommonly used in dogs

Cholinergic agents
These medications contract the ciliary body resulting in miosis and improved drainage through the outflow pathways. They are either direct acting (stimulate cholinergic receptors directly), or indirect acting by inhibiting acetylcholinesterase.

Direct acting cholineragic agent
Pilocarpine. This medication is rarely used in the management of glaucoma due to topical irritation. Its use should be avoided if anterior uveitis is present.

Indirect acting cholinergic agent:
Demecarium bromide. This is a long-acting medication that is usually supplied in either 0.125% or 0.25%. This medication is used in the treatment of glaucoma, but it is also used to maintain a luxated lens in the vitreous cavity by constricting the pupil.

Other less commonly used topical glaucoma medications:
Dipivalyl epinephrine. This an epinephrine pro-drug that is a symptomatic agent. It reduces IOP by decreasing formation of aqueous and increasing the outflow.
Apraclonidine. This is an α2 agonist. It reduces IOP by reducing production of aqueous humor. Side-effects may include blanching of the conjunctiva and mydriasis in dogs. Bradycardia was seen occasionally. Bradycardia can also be observed when this medication is used in cats. In contrast to dogs, this medication causes miosis in cats. It also caused vomiting when used experimentally in cats and this drug is therefore not recommended in cats.