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OPHTHALMIC NEOPLASIA

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INTRODUCTION
Neoplasia involving the ocular tissues is frequently encountered in veterinary practice. Species-specific differences occur and these may have significant impact on the biologic behavior and long term prognosis for the patient. Primary ocular neoplasia occurs when the eye is the site of origin and secondary ocular neoplasia occurs when the eye is the site of metastatic disease. Ocular neoplasia may involve the orbit, eyelids, conjunctiva, cornea or intraocular structures.

Orbital neoplasia arises from the epithelial and mesenchymal tissues that line the orbit. Direct extension occurs from the nasal cavity, sinuses and hematogenous routes. The clinical signs include unilateral exophthalmos, swelling of the eyelids or conjunctiva, prominent or elevated nictitans, exposure keratitis, deviated globe, dilated or eccentric pupil, chemosis or scleral injection and retinal detachment. These tumors are generally nonpainful on manipulation of the temporomandibular joint.

The diagnosis of orbital neoplasia is made using a combination of clinical signs and ancillary diagnostic procedures. Efforts are made to try and identify where and what the type of tumor is before deciding the appropriate course of therapy. Unfortunately, many types of orbital neoplasia are malignant and by the time clinical signs occur, complete surgical excision is not possible. Advanced diagnostic modalities including CT scans, MRI, orbital ultrasound and skull radiography are useful in determining the site for appropriate biopsy, extent and location of the disease process. CT scan may be the preferred diagnostic test as it will reveal areas of bone involvement. MRI is preferred for soft tissue studies. Orbital ultrasound is helpful in diagnosing the general location of the mass but it is limited by the bones of the orbit. Fine needle aspiration may be obtained or incisional biopsy of affected tissues for histological confirmation. Advanced diagnostic techniques will allow accurate site determination for biopsy procedures and help reduce risk to adjacent ocular structures. When the neoplastic tissue invades the bones, sinuses, oral cavity or brain, surgical excision is not recommended and the long term prognosis is poor. Depending on the type and location of the tumor, excision with adjunct radiation or chemotherapy may prolong the quality of life.

Osteosarcoma is the most common bone neoplasm and causes osteolytic and osteoproductive lesions around the orbit. This type of orbital neoplasia is locally aggressive and may occur in the dog or cat. Excision of affected tissues may be performed through orbital extenteration or orbitotomy procedures. These procedures may be palliative at best unless adjunct radiation treatment of the orbit is employed. Local recurrence is common as the tumor may extend into adjacent bony structures.

Multicentric lymphosarcoma occurs in the bovine, canine, feline and mice. In the bovine, bilateral exophthalmos is the most common clinical sign. The tumor may fill the orbit and invade the extraocular muscles and optic nerve. Lymphosarcoma may cause the globe to collapse but rarely extends into the globe. Indentation of the globe may be a clinical sign on CT scan suggestive of orbital lymphosarcoma. Hematogenous metastasis to the globe may occur with this disease.

Squamous cell carcinoma arises from the eyelid, bulbar conjunctiva or orbital bones. Bovine and equine are more commonly affected than the canine and feline. This tumor causes necrosis, hemorrhage and ulceration of adjacent tissues. Metastasis to the lungs, liver and kidneys are possible.

Orbital adenocarcinoma often occurs as a metastasis condition from the nasal cavity. These tumors are generally aggressive. Adenomas or adenocarcinomas may arise from the lacrimal glands, zygomatic salivary gland or gland of the nictitans.

Melanoma of the globe (epibulbar melanoma) is most commonly found in the German Shepherd breed as a pigmented, raised limbal or scleral mass usually found at the superior temporal aspect of the globe. These tumors are generally benign although they may be fast growing in younger dogs. In older dogs, the tumor may be static for years. Over time, the tumor may destroy the globe and invade intraocular tissues. Treatment of choice is reduction/excision of the mass using laser surgery, cryosurgery or grafting techniques. In extensive cases, enucleation is recommended.

Other types of orbital neoplasia reported include neurofibrosarcoma, rhabdomyosarcoma, chondrosarcoma, chondroma rodents, reticulosis, meningioma, hemangiosarcoma and hardener gland tumors, and angiosarcoma.

Eyelid neoplasia arises from epithelial, mesenchymal and melanogenic cells (similar to skin). Eyelid neoplasia is found in all domestic animals. In the canine, sebaceous gland adenoma is most common followed by papilloma and melanoma. Squamous cell carcinoma is most common in the bovine. In general, eyelid tumors in dogs are often benign and eyelid tumors in cats are often malignant. Eyelid tumors of epithelial origin include papilloma with finger-like projections, squamous cell carcinoma (bovine>feline>equine), sebaceous gland tumors and basal cell tumors. Mesenchymal tumors arise from fibroblasts, mast cells, histiocytes and endothelial cells. Specific tumors include the equine sarcoma, fibroma/sarcoma, neurofibroma/sarcoma, hemangiomia/sarcoma, mast cell tumor, cutaneous histiocytyoma (young dogs), melanogenic tumors and transmissible venereal tumor.

The treatment of choice for eyelid tumors is surgical excision with histopathological examination. Care should be taken determine whether the margins are free of diseased tissue. The goal of surgery is to remove all affected tissue while maintaining normal eyelid function. Various techniques are effective including wedge resection for tumors involving less than one quarter to one third of the eyelid margin, eyelid grafts (H-plasty, pedicle and rotating grafts for tumors involving over one third of the eyelid margin) and carbon dioxide laser. The technique employed is the surgeon's preference although advanced techniques are generally more challenging and may not offer specific advantages over more easily performed techniques.

 Conjunctival neoplasia reported includes the dermoid, squamous cell papilloma and squamous cell carcinoma. The dermoid is a congenital mass of cutaneous origin that occurs on the ocular tissues. Clinically a dermoid is a raised, grey, white or pigmented mass at the corneoscleral junction that
may have hair on the surface. Treatment of choice is surgical excision.

**Corneal neoplasia** is usually secondary and includes hemangiosarcoma, lymphosarcoma, epithelioma, fibrosarcoma and histiocytoma. Histiocytoma is the most common corneal neoplasm.

**Canine ocular melanogenic neoplasia** is a primary tumor, often benign, that involves the anterior uvea tract. The degree of pigment varies and it may include the iris and ciliary body. These tumors generally are slow growing and eventually infiltrate the iridocorneal angle. Secondary glaucoma and uveitis are common sequelae. The intraocular melanoma is the most common type of intraocular neoplasia. In the canine, the anterior uvea is primarily involved and metastatic potential is low whereas in the feline, anterior uvea is primarily involved and metastatic potential is high. In the posterior segment, a choroidal melanoma may occur. In domestic animals, this type of neoplasia is generally benign and not locally aggressive.

**Diffuse iris melanoma** is the most common primary ocular neoplasm in the feline. This pigmented tumor often involves the iris as dark, raised, “velvety” tissue that may involve portions of the iris or extend across the iris face and into the iridocorneal angle. Secondary glaucoma and anterior uveitis are common sequelae. The iris melanoma must be distinguished from the freckles or nevi (melanosis) which are benign, flat areas of pigment. Clinically, it is difficult to distinguish histological behavior based upon physical appearance or location of the pigment. Anterior uveal melanomas in felines are usually malignant and have high metastatic potential to the viscera, liver and lungs (may occur over years). The iris may be dark, thickened and cause dyscoria. Diffuse darkening across the iris face may occur. Local iris pigment changes in aged felines are normal and periodic monitoring is recommended. When diffuse iris melanoma is suspected, enucleation should be performed. Slit-lamp examination of the anterior iris surface and iridocorneal angle may help to determine whether the pigment change is likely to be benign or malignant. Definitive diagnosis may only be determined by histopathological examination of the affected tissues.

**Ciliary body neoplasia** is the second most common type of intraocular tumor in canines and felines. Ciliary body adenoma/adenocarcinomas are derived from embryonic epithelium (pluripotential) and appear as nonpigmented tumors visible in the anterior chamber. Secondary asteroid hyalosis (vitreal degeneration), hemorrhage or papillary blockade may occur. The adenoma is often characterized by its retrolidal (endophytic) location whereas the adenocarcinoma may extend into the anterior chamber (exophytic) from the iris root. Secondary metastasis may occur to the lungs. Secondary anterior uveitis and glaucoma are more common with the antigenic adenocarcinoma. Anterior chamber centesis may be beneficial as medulloepitheliomas and lymphosarcoma may extrude cells into the aqueous humor. Ciliary body tumors may be observed if slow growing or an excisional biopsy may be performed (risk of incomplete excision, retinal detachment, hyphema, or secondary glaucoma exists with this procedure). In most cases, an enucleation is performed and is usually curative. Other types of ciliary body tumors include medulloepithelioma derived from neural ectoderm and astrocytoma as an extension from the optic nerve.

**Feline post-traumatic sarcoma** is an aggressive, destructive neoplastic condition that may occur 1-10 years after trauma to the globe. These anaplastic spindle cell tumors invade circumferentially are seldom painful. The cornea may be pale and globe may be firm. Extension to the retina, optic nerve and optic chiasm may occur. Blindness and neurological disease with metastatic potential are risks. This type of tumor is thought to arise from liberated lens epithelial cells. Enucleation is recommended.

Secondary tumors of the globe occur by direct extension from the surrounding tissues to the iris, ciliary body, retina, and choroid and through hematogenous routes. Reported tumors include lymphosarcoma, hemangiosarcoma, mammary carcinoma, oral malignant melanoma, meningioma and transmissible venereal tumor. Clinical signs include anisocoria, unilateral glaucoma or hyphema, scleral congestion, corneal edema, blindness, obvious mass or protruding nictitans as the contents of the globe are distorted. Lymphosarcoma is a common secondary intraocular neoplasm in the canine, feline and bovine (bilateral exophthalmos). In the canine, bilateral involvement is more common than in the feline. Hemorrhage, uveitis, glaucoma, iritis, aqueous flare, corneal edema and interstitial keratitis are due to local infiltration of neoplastic cells. Treatment for multicentric disease is indicated (chemotherapy). Anterior uveitis should be treated with prednisolone acetate 1% four to 6 times daily, atropine sulfate 1% once to twice daily, and systemic anti-inflammatory medication (oral prednisolone as part of chemotherapy protocol likely). Adjunct Neomycin / polymixin / dexamethasone four to six times daily with nonsteroidal (flurbiprofen, diclofenac) therapy twice daily may be indicated. Once systemic treatment is instituted, the ocular inflammation generally responds favorably to topical therapy.

**CONCLUSION**

In summary, a complete physical exam and complete ophthalmic exam should be performed when ocular neoplasia is suspected. Ancillary diagnostic methods to be employed may include ocular ultrasound, radiography, cytology, histopathology, complete blood count, serum chemistry, CT scan and MRI. Treatment may involve surgical excision, radiation, chemotherapy, cryosurgery, laser ablation and hyperthermia. The practitioner must take into consideration the expected biologic behavior of the condition with the species involved, equipment available and intended use of the pet before deciding on the appropriate therapy.