

ORBIT

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Required reading: This handout

Recommended: Essentials of Veterinary Ophthalmology by Kirk N. Gelatt, 2000, pp 27-46, and pages 344-346 (Equine), 295-297 (Feline) and 380-381 (Food Animal).

Objectives:

1. Know the diagnostic procedures for orbital diseases and their indications/contraindications.
 2. Be able to recognize the congenital/inherited orbital diseases of domestic animals.
 3. Be familiar with the causes of exophthalmia and enophthalmia, and be able to formulate a diagnostic or therapeutic plan for these diseases.
 4. Know the indications/contraindications for; and the differences between; evisceration and prosthesis, enucleation with or without an orbital prosthesis, exenteration with or without an orbital prosthesis, and a scleral shell.
- I. APPLIED ANATOMY**--Differential diagnoses for orbital disease is based on orbital/periorbital anatomy and is relatively easy since only a limited number of tissues can be involved.
- A. Significant Periorbital Structures**-- Diseases here may compress or invade the orbit.
1. **sinuses** - frontal, maxillary.
 2. **teeth** - especially upper fourth premolar (carnassial).
 3. **ramus of the mandible** – when the mouth is opened the ramus moves anteriorly and compresses the orbital soft tissues.
- B. Clinically Significant Foramina and Fissures of the Orbit**
1. **optic foramen** - optic nerve (II). The dura of the optic nerve is continuous with the brain's dura so injections into the nerve can affect the brain.
 2. **foramen orbitotundum** (cow, sheep, pig) - III, IV, V (both parts), VI, and maxillary artery. This is the site of the Peterson nerve block in cattle for enucleation.
 3. **supraorbital foramen** (horse) - Landmark to block sensation to the upper lid (frontal

nerve). A branch of the auriculopalpebral nerve (VII) runs over the foramen just under the skin so motor can also be blocked.

- C. **Intraorbital Structures** - globe, nerves (II-VII), blood vessels, gland of the 3rd eyelid, lacrimal gland, zygomatic salivary gland, extraocular muscles, masticatory muscles, fat, and periorbita. Bone and sinuses incompletely surround the orbital soft tissues in domestic animals. Alterations in any of the bony or soft tissues also alters the remaining tissues and usually the position of the eye.

II. DIAGNOSTIC PROCEDURES - Always strive for an accurate diagnosis prior to Rx.

- A. **Physical Examination** - look, feel, retropulse the globe, open the mouth. Pain on opening the mouth is typical of inflammatory orbital disease, whereas neoplasia tends to be nonpainful. This is the cheapest, most effective diagnostic procedure and must be performed thoroughly in order for further diagnostic tests to be appropriately selected.
- B. **Radiography** – Take films before invading the orbit to avoid confusing artifacts.
 - 1. **Plain films** - Useful if bony or sinus disease is suspected. Can be difficult to interpret. Usually need general anesthesia. Soft tissue does not show up well on plain films but the globe can be approximated by placing a thin metal ring (or bent paperclip) in the conjunctival cul-de-sac. Plain films rarely give an exact diagnosis but can be very helpful in suggesting a prognosis. (Bony involvement suggests a poorer prognosis).
 - 2. **Positive contrast radiographs** - seldom performed.
- C. **Computerized Tomography/Magnetic Resonance Imaging** - Soft tissue resolution is enhanced and multiple cross-sectional views make them more useful than plain or contrast radiographs. CT/MRI is also very helpful in planning surgery of the orbit. Disadvantages are limited availability, need for general anesthesia, and expense.
- D. **B scan Ultrasonography** - Do before invading the orbit. Helpful in soft tissue disease and in guiding a fine-needle aspirate of a small or localized lesion. Does not image bone well. Does not require general anesthesia. With experience the soft tissue images can be mentally combined with radiographs to better characterize the orbital disease.
- E. **Aspiration and cytology** - An aspirate or biopsy is usually required to get an accurate diagnosis in orbital disease. Disadvantages are possible damage to important orbital structures (optic nerve), infection, failure to indicate the full extent of the pathology, the need for anesthesia or sedation (some patients), and getting an unrepresentative sample. Usually failure to yield a diagnosis is because the lesion is small or localized, unrepresentative tissue was sampled, or lack of tissue architecture to aid in diagnosis. Neoplasia can be missed if only the necrotic center of a tumor is aspirated.

- F. Surgical Exploration of the Orbit** - Necessary if less invasive techniques fail to yield a diagnosis. It allows you to fully assess the extent of the disease, it can be therapeutic as well as diagnostic, and provides representative tissue for pathology. Disadvantages include general anesthesia, the need for advanced surgical training, infection, potential disfigurement or damage to vital structures, time involved and the expense.

III. ORBITAL DISEASES - Because the orbit forms a semi-closed space, alterations in any one of the orbital contents alters the rest of the orbital contents. **Exophthalmia results if orbital volume or pressure is increased caudal to the equator of the globe. Enophthalmia results if orbital volume or pressure is reduced, or if orbital volume is increased anterior to the equator of the globe. A differential diagnosis list is created by considering what pathologic processes can affect the few tissues in the orbit and produce the observed deviation in the globe.** Clinically one must differentiate exophthalmia from "apparent exophthalmia" due to shallow orbits in brachycephalic breeds, enlarged palpebral fissures, facial paralysis, and glaucoma with globe stretching.

A. Congenital/Inherited Orbital Disease

1. **Microphthalmos** - Abnormally small eye. Especially in color dilute breeds.
2. **Cyclopia** - In lambs due to consumption of *Veratrum californicum* by pregnant ewes in Idaho and Utah at day 14 of gestation.
3. **Divergent Strabismus** - most common in brachycephalic breeds. Rarely treated.
4. **Convergent strabismus** ("cross-eyed"). Rarely treated
 - a. cat - autosomal recessive - very common in Siamese.
 - b. cattle - recessive in Jersey and Shorthorn, unknown in Holsteins.

B. Acquired Orbital Diseases – Always try for an accurate diagnosis prior to therapy.

1. **Exophthalmia** - differential diagnosis
 - a. **Proptosis** - exophthalmia with contracture of the eyelids behind the globe. Hit by cars and facial bite wounds are the 2 most common causes. Greater force required to proptose enophthalmic breeds or species with complete bony orbital rim. When in doubt, replace the globe; it can always be removed later. Although a proptosis is easy to diagnose, radiographs/US may also help determine the extent of disease.
 - b. **Orbital cellulitis/retrobulbar abscess** - common, especially in dogs which chew on sticks or bones. Often diagnosed by physical examination (look or probe behind last

molar) and the presence of pain on opening the mouth. Some need a full diagnostic work-up including aspiration/cytology with a culture and sensitivity.

- c. **Eosinophilic myositis** - German Shepherd especially. Enophthalmia can occur in long-standing cases from postinflammatory fibrosis. Breed, pain on opening the mouth, bilaterally swollen muscles, and muscle biopsy make the diagnosis.
 - d. **Extraocular muscle myositis** - Bilateral exophthalmia in dogs due to localized inflammation and swelling of the extraocular muscles. Its presumed to be immune-mediated, is steroid responsive and is diagnosed by PE +/- muscle biopsy.
 - e. **Neoplasia** - primary, metastatic, or an extension from surrounding tissues. A full work-up including a CT scan and surgical exploration may be needed. The prognosis is often poor as they are often malignant and quite extensive at initial presentation. Therefore an aspirate and a skull radiograph showing bony lysis may be enough.
 - f. **Orbital emphysema** - Following orbital surgery or after a fracture into a sinus. History and physical examination (gas crepitation) are usually diagnostic.
 - g. **Zygomatic mucocele** - (may also see enophthalmia if anterior to the globe). Often diagnosed by aspirating a fluctuant cyst and finding a viscous, saliva-like fluid.
 - h. **Retrobulbar hemorrhage** - following trauma or in patients with bleeding disorders. Usually history or bleeding elsewhere aid diagnosis. Aspiration and cytology is usually unrewarding since it can be difficult to differentiate iatrogenic hemorrhage from pathologic. Large amounts (>0.5ml) of non-clotting dark blood would suggest a hematoma but doesn't rule out hemangioma/hemangiosarcoma.
 - i. **Retrobulbar granulomas or pseudotumors** - due to parasite migration, retained foreign bodies, or fungal infections (Blastomycosis). A full diagnostic work-up perhaps including surgical exploration may be necessary.
2. **Enophthalmia** - differential diagnosis. PE usually suggests the cause.
- a. **Ocular pain** with globe retraction.
 - b. **Dehydration** with loss of orbital fluid.
 - c. **Emaciation** with loss of orbital fat.
 - d. **Myopathies** of extraocular or masticatory muscles with loss of muscle mass. In some cases only these muscles are affected and other skeletal muscles are normal.
 - e. **Periorbital fractures or trauma**. Hemorrhage from the nostril suggests the sinus

may have been invaded, making the fracture an open fracture. This has a higher infection rate and more complicated course.

- f. **Horner's syndrome.** Rarely seen as enophthalmia alone.
- g. **Microphthalmia or phthisis bulbi.** A small eye.
- h. **Space occupying lesions anterior to the globe.** Maxillary sinus abscess, an anteriorly located zygomatic salivary gland sialocele etc. A full diagnostic work-up as in patients with exophthalmia may be needed.
- i. **Tetanus** in sheep and horses.
- j. **Post-operatively** due to loss of orbital contents or following contraction of surgical scar tissue.

IV. ORBITAL SURGERY

- A. **Enucleation With or Without an Orbital Prosthesis** - Removal of only the globe. A silicone intraorbital prosthesis can be used to improve cosmesis. A prosthesis is contraindicated in the presence of orbital infection or neoplasia.
- B. **Exenteration With or Without an Orbital Prosthesis** - The removal of all of the orbital contents and the globe. Usually performed for orbital neoplasia or infection. An orbital prosthesis can be implanted if there is no residual neoplasia or infection.
- C. **Evisceration and Intraocular Prosthesis** - Removal of the intraocular contents leaving the corneo-scleral shell that is then filled with a silicone prosthesis. Contraindicated in the presence of intraocular infection, concurrent ocular disease such as corneal ulceration or dry eye, and ocular neoplasia. More cosmetic than an enucleation.
- D. **Extrascleral Prosthesis (shell)** - This is the typical artificial eye used in humans and is rarely performed in veterinary ophthalmology due to difficulties in maintaining the prosthesis in place and its expense. Occasionally done in show horses.
- E. **Orbitotomies** - Numerous approaches ranging from minor "cut-downs" to allow a more accurate biopsy to extensive surgical procedures involving reflection of the zygomatic arch. Choose the least invasive approach that permits the most tissue to be salvaged. See Orbit chapter in the Textbook of Small Animal Surgery by Douglas Slatter for more details.