

EYELIDS

Paul E. Miller, DVM, Diplomate ACVO

Reading Assignments

Required: This handout.

Recommended: Eyelids in Slatter's Fundamentals of Veterinary Ophthalmology by David J. Maggs, Paul E. Miller and Ron Ofri

OBJECTIVES

1. Be able to describe the normal anatomy and functions of the eyelids.
2. Be able to identify and differentiate the congenital and eyelash diseases discussed in this lecture, and suggest appropriate treatments for these diseases.
3. Be able to identify diseases resulting in an abnormal globe-to-lid conformation or palpebral fissure motility disorder, and suggest appropriate therapies and prognoses for these conditions.
4. Be able to list and identify the inflammatory conditions affecting the eyelids and suggest an appropriate diagnostic and therapeutic strategy for these conditions.
5. Know that eyelid lacerations should be treated atraumatically, quickly and closed in two layers following minimal debridement.
6. Be able to suggest a diagnostic and therapeutic strategy for neoplasms affecting the eyelid, and be able to suggest a prognosis for the most common eyelid neoplasms in each species.

I. BASIC ANATOMY AND PHYSIOLOGY

A. Detail of the eyelid structures

1. **Overlying Skin** - Protects the eye.
 - a. **skin** is covered with hair for external protection.
 - b. **cilia** (eyelashes) protect the globe.
 - c. **Vibrissae** - longer, stiffer periocular hairs that warn of potential unseen hazards.

- d. modified skin similar to **eyebrows** in man act like a shock absorber.
 - e. **Sensory innervation** is via CN 5.
2. **Eyelid Muscles** - All are innervated by CN 7 except the levator which is innervated by CN 3. These muscles protect the eye and facilitate vision.
- a. Muscle which **closes** the eyelids/palpebral fissure - **orbicularis oculi** -- sphincter-like skeletal muscle.
 - b. Muscles which **open** the eyelids/palpebral fissure
 - 1) **Upper eyelid** - most mobile.
 - a) **levator palpebrae superioris** -- Main skeletal muscle elevator of the upper lid.
 - b) 2 other less important skeletal muscles.
 - c) **Muller's muscle**-- Smooth muscle lifting the upper lid and causes the ptosis in Horner's syndrome.
 - 2) **Lower eyelid** - A skeletal muscle of lesser importance depresses the lower lid.
3. **Tarsus** - Provides structural rigidity to the eyelids, and is important surgically. It's a poorly defined dense connective tissue structure between the orbicularis oculi muscle and the palpebral conjunctiva near the lid margin.
4. **Glandular Structures**
- a. **Meibomian glands** - sebaceous glands embedded in the tarsus near the lid margin. They secrete lipid that stabilizes the precorneal tear film. The duct openings on the lid margin are important surgical landmarks.
 - b. **Glands of Zeis and Moll** are two other glands of minor importance at the base of the lid cilia which, when inflamed, form hordeolum (stys).
5. **Vasculature**
- a. Eyelids are very vascular making them heal rapidly and resistant to infection.
 - b. Palpebral conjunctiva normally is redder than the bulbar conjunctiva. This is important clinically because a misdiagnosis of ocular inflammation can be made by

comparing the whiter bulbar conjunctiva to the redder palpebral conjunctiva, or by examining only the palpebral conjunctiva.

- c. Venous drainage is mainly via the angularis oculi vein in the medial canthus. Avoid when enucleating.
 - d. Lymphatic drainage is via parotid and mandibular lymph nodes. Check these in infectious/neoplastic disease.
6. **Conjunctiva** - Reduces the friction of the eyelids on the cornea, and is a site for immunological regulation.

B. Function of the Eyelids

- 1. Protect the eye from trauma, foreign material and light.
- 2. Immunological regulation of the ocular surface and resistance to external infection.
- 3. Produce portions of the precorneal tear film.
- 4. Spread the tear film.
- 5. Pump tears to the nasolacrimal system.

II. MEDICAL AND SURGICAL PROBLEMS OF THE EYELIDS

A. Congenital Diseases

- 1. **Physiologic Ankyloblepharon** - fusion of the eyelids is normal in dogs and cats in the early postnatal period (10-16 days). Is abnormal in large animals.
- 2. **Ophthalmia neonatorum**
 - a. Is an infection under the fused lids that is commonly due to Staph or Strep. in the dog; and Chlamydia or Herpes in the cat. It may result from intrauterine infection, inoculation during passage through the genital canal, or acquired postnatally. The lids are usually swollen from purulent material underneath and there may be discharge from the medial canthus.
 - b. Treatment is to establish drainage by carefully opening the lids. Usually warm compresses followed by gentle manual traction is enough. Seldom is sharp surgical incision necessary, and blade misplacement can result in removal of the lid margin and meibomian glands. Culture and cleansing followed by topical antibiotics are optimal in most cases. Antivirals may be needed for feline herpesvirus keratitis.

3. **Agensis of the eyelid (eyelid coloboma)** -- rare
 - a. Most often as superior temporal eyelid defect in the cats resulting in lagophthalmos with secondary exposure keratitis. Multiple techniques for repair are available.
 - b. May also be seen as a notch-like coloboma of the lid (especially central lower lid).

B. Eyelash Diseases: Common in the dog.

1. **Trichiasis:** An eyelash (cilia) originating from the normal position on the eyelid but curving towards the eye. Often is secondary to inflammation or trauma where scarring or swelling changes the lid's conformation. The term also may refer to normally located facial hair (as opposed to eyelashes) that rub on the eye as occurs in brachycephalic breeds. Correction is directed at the primary problem.
2. **Distichiasis:** Cilia emerging from the orifices of the meibomian ducts. Therapy is indicated if there are overt signs of corneal/conjunctival disease. Rx options include:
 - a. **Manual epilation:** Temporary fix only, the hair may regrow thicker, stiffer, or directed towards the cornea.
 - b. **Electroepilation (Electrolysis):** Destruction of the hair and its follicle with heat via a very fine needle placed into the follicle. Works well if only a few offending distichia. Regrowth is common and scarring may occur if not performed carefully.
 - c. **Cryosurgery:** Technique of choice if many offending distichia as it is the easiest, fastest, most economical and least disfiguring procedure. Hair follicles are more susceptible to cellular damage by freezing with nitrous oxide than the surrounding tissues thus providing selective destruction of the lashes without lid scarring.
 - d. **Lid Splitting:** Once popular, this technique has generally been abandoned because of the greater efficacy and ease of cryosurgery; and because of its frequent severe complications due to lid margin destruction, secondary entropion, and regrowth.
3. **Ectopic Cilia:** Distichia that have emerged through the palpebral conjunctiva instead of the meibomian duct orifice. These can become a problem any time during life although they have been present since birth coiled up in the meibomian gland. The typical presentation is sudden onset of blepharospasm, epiphora and maybe a corneal ulcer. They usually occur on the upper eyelid and opposite the corneal ulcer. High magnification with a head loupe or direct ophthalmoscope is often necessary to identify them. Treatment is resection of the affected area of tarsus.
4. **Nasal folds** In brachycephalics hairs on these folds can occasionally rub on the cornea.

More often, medial lower lid entropion and lagophthalmos is the cause of the corneal pigmentation/vascularization in these breeds. Fold excision is indicated if folds rub on the globe or chronic nasal-fold skin infection exist.

C. Abnormal Globe to Eyelid Conformation. The underlying principle to understanding the following diseases is that there is an abnormal relationship of the globe to the eyelids. As long as the eyelid to globe relationship is maintained within certain tolerance ranges no pathology will result. These abnormalities can occur due to abnormal eyelids with a normal globe, normal eyelids with a abnormal globe, abnormal eyelids with an abnormal globe, or normal eyelids and globe with abnormal orbital or facial anatomy. The goal of therapy is to identify and correct the underlying problem and restore a globe to eyelid relationship.

1. **Narrow Palpebral Fissure (micropalpebral fissure)** - An abnormally small palpebral fissure seen in collies, chows, shelties etc. If the globe is normal sized, entropion will result. If the globe also is smaller than normal there may be no problem. Treatment may be to permanently lengthen the lids by opening up the lateral canthus.
2. **Large Palpebral Fissure (macropalpebral fissure)** - Seen primarily in brachycephalic breeds with large eyes and shallow orbits and often results in lagophthalmos. It may also be seen in patients with eyes that have become smaller than normal due to inflammation and normal sized lids. Treat by partially closing down the medial and/or lateral canthus.
3. **Entropion** - Rolling in of the eyelid margin. Very common.
 - a. **Congenital (Hereditary) entropion** - In lambs and foals it's present at birth, in dogs "congenital" entropion usually occurs during the first 6-12 months of life. In all species it usually has an anatomic and spastic component and is usually bilateral. The anatomic component is very variable. Usually the lateral lower eyelid is involved, although it can also occur in the upper lid, or medial lower lid.
 - 1) Predisposing conditions under genetic control include:
 - a) large orbit/small globe with a deep set eye that doesn't support the lids.
 - b) defects in orbicularis muscular development or attachment with a rounded lateral canthus,
 - c) abnormally large/small palpebral fissures,
 - d) excessive facial folds (Shar-pei and Blood Hound).
 - b. **Acquired entropion**
 - 1) May be permanent resulting from previous surgery, trauma, scarring, chronic

inflammation, or temporalis/masseter muscle atrophy.

2) May be temporary resulting from dehydration, malnourishment, a foreign body, dry eye, ectopic cilia, ocular pain etc. that with temporization may resolve with resolution of the primary problem.

3) In long standing cases the spastic component may result in hypertrophy of the lid tissues creating an anatomical component to the entropion which requires definitive surgical correction.

4) Usually has both spastic and anatomical components but may be purely spastic or purely anatomic.

c. **Principles of repair:** Ask yourself:

1) **Why is the lid rolling in?** -- Is it due to an abnormal lid, abnormal globe, abnormal orbit or a combination of these? Identify the underlying cause and repair that if possible.

2) **Is the entropion permanent or temporary, or do I need to fix this permanently or temporarily? Never try to permanently (definitively) correct a problem that is merely temporary.** Separate and temporize those components that will change as the animal grows, rehydrates, gains weight etc. Do not repair congenital entropion definitively until the animal has reached adolescence (usually 6 mo) unless temporary measures fail to control the problem and then undercorrect and try to temporize again until 6 mos. Many puppies "grow into their face" and definitive surgery can be avoided by temporary lid tacking, lubrication, or temporary tarsorrhaphy.

3) **If permanent repair is needed, how much of the entropion is anatomic and how much is spastic?** Anatomic entropion is an actual physical defect in the globe-eyelid relationship and is usually, although not always, permanent. Spastic entropion is usually temporary and due to the inversion of the lid from orbicularis oculi spasm. Most cases of entropion have a combination of anatomical and spastic components making entropion a dynamic rather than static process. A vicious cycle is perpetuated where the anatomical component irritates the eye, resulting in blepharospasm, which irritates the eye more, leading to worsening of the entropion with more blepharospasm.

a) Topical anesthetics (used diagnostically) help alleviate the spastic component making it easier to assess the amount (if any) of the anatomic component. Do not sedate or anesthetize to determine the anatomic component as this alters the dynamic globe:lid relationship. **Corrective lid surgery is performed only for the anatomic component.** If the spastic component is not

accounted for, over- correction will result. The spastic component is temporized if needed while the surgical site heals.

- 4) **Have I planned the surgical procedure carefully prior to the actual event, do I have the expertise to perform the contemplated procedure, and can I tailor standard surgical procedures to this individual animal?**
- 5) **Have I counseled the client about the genetic implications, possible elimination from the show ring, surgical/anesthesia complications, potential need for additional surgery or change in appearance, etc?**

d. Temporizing therapy

- 1) Lid tacking
- 2) Temporary tarsorrhaphy
- 3) Ophthalmic ointments
- 4) Manual eversion of the eyelids.

e. Permanent surgical therapy (details in Gelatt and Surgery Manual)

- 1) Modified Hotz-Celsus (simple elliptical excision)
- 2) Permanent lateral and/or medial Tarsorrhaphy
- 3) Arrow-head variation of Modified Hotz-Celsus
- 4) Combinations of above and numerous others.

4. **Ectropion** --Outward rolling of the eyelid with resulting exposure keratoconjunctivitis. Less common than entropion.
 - a. **Inherited Form:** Seen in certain breeds such as spaniels, hounds, Bull dogs, Saint Bernards and others with variable severity. Some do not have any secondary problems whereas others are only bothered when eyelid muscles are weakened (after exercise, when ill etc). Others are always affected and have a chronic conjunctivitis/keratoconjunctivitis. Often congenitally affected animals will not need surgical correction but only lubrication. As the animal grows the orbital contents increase and conformation changes so that ectropion is less of a problem or resolves.
 - b. **Acquired Forms:**
 - 1) Senile form seen in older animals.

- 2) Cicatricial form - after entropion surgery (over-correction) or lid trauma.
- 3) Neurological form due to facial nerve deficits.

c. **Specific Therapy**

- 1) Mild cases with no conjunctival irritation do not require therapy. If it is intermittent, rest and perhaps topical lubricants until lids return to normal.
- 2) If there is chronic conjunctivitis and/or keratitis, or the ectropion is disfiguring, surgical correction is performed. The basic goal is usually to shorten the lid via a V-plasty or lateral blepharoplasty.
- 3) In the cicatricial form a V-Y plasty may be indicated.

5. **Combined Entropion-Ectropion**

- a. Seen as a "diamond eye" in certain breeds such as the Cocker Spaniel, Saint Bernard, English Bulldog and others in which there is a central ectropion and a lateral (sometimes medial also) entropion.
- b. **Therapy** - usually a referral surgery as these dogs are technically very challenging.

6. **Lagophthalmos**-- Inability to close the eyelids completely. Lid function is impaired by:

- a. abnormally shallow orbit in brachycephalic dogs and cats and is best treated by canthal closure surgeries.
- b. secondary to buphthalmos (enlarged globe secondary to increased intraocular pressure). Best treated by a procedure which reduces the size of the globe such as enucleation, evisceration and prosthesis etc.
- c. Neurologic disturbances - treat with canthal closures.
- d. Retrobulbar masses - treat the mass.

D. Palpebral Fissure Motility Disorders The globe:lid conformation is normal but the eyelid closure is abnormal due to a neurological defect.

1. **Neurologic Lagophthalmia**--Often results in keratoconjunctivitis and dry eye with central corneal disease.
 - a. **CN 7 palsy** following head trauma or otitis media.

- b. **CN 5 palsy** - Decreased corneal sensitivity reduces the blink reflex and frequency. Common in brachycephalics.
 - c. **Therapy** may include a permanent medial and lateral tarsorrhaphy along with artificial tears. Topical antibiotics may be necessary.
2. **Ptoxis** -- Upper eyelid droop.
- a. **Horner's syndrome** -Therapy is aimed at correcting the underlying etiology.
 - b. **Post-traumatic** in which the levator was lacerated and not repaired. Usually in domestic animals the levator is not repaired specifically but accurate two-layer closure of deep lid lacerations is usually sufficient.
3. **Blepharospasm** - Although this is usually the result of ocular irritation or pain, it can be the result of disturbed innervation. Ex. post-distemper nervous twitch.

E. Inflammatory Eyelid Diseases--The eyelids are modified folds of skin so they develop the same dermatologic problems that occur elsewhere. Much of the following will be covered in more detail in dermatology. Some of these lesions are diagnosed by gross appearance, others require a typical dermatologic work-up consisting of a bacterial and fungal culture, skin scraping, biopsy, and possibly skin testing for allergies.

1. **hordeolum** - Usually diagnosed by gross appearance only.
- a. **Internal hordeolum (Meibomianitis)** -Individual swollen meibomian glands seen when the lid margin is everted.
 - 1) Often puppies as an acute painful lid swelling.
 - 2) Staphylococcus aureus is commonly isolated.
 - 3) Therapy includes anesthesia and lancing (conjunctival surface) of all affected meibomian glands followed by systemic and topical antibiotics/steroids. Warm compressing is also helpful.
 - 4) Adult dogs - a chronic form that may require, in addition to the above, therapy with Staphage Lysate (SPL) vaccine to treat a possible immune component.
 - b. **External Hordeolum (Sty)** - abscess of the gland of Zeis at base of cilia follicle. Treatment similar to a.
2. **Chalazion**--Usually diagnosed by gross appearance although biopsy may be needed to rule

out a neoplastic obstruction.

- a. Meibomian gland impaction resulting in a focal distention especially well seen on the palpebral conjunctival surface. Infection is usually not a primary problem.
- b. Under topical or general anesthesia the area is isolated with a chalazion clamp, the conjunctiva incised, and the lesion is curettaged and left open.
- c. Culture inflamed or purulent lesions. Systemic antibiotics, and topical antibiotic/steroids are used post-op. Warm compresses may be helpful.
- d. Watch for post-op keratitis as a sequelae to the lesion on the tarsal surface.

3. **Medial Canthal Erosion**--Often needs a full derm work-up to diagnose the etiology.

- a. Etiologies include bacterial dermatitis (Staph sp.), immune-mediated, and neoplasia (SCC).
- b. Chronic epiphora may predispose.
- c. Bacterial culture should be attempted. Rule out a neoplastic process (biopsy if chronic/nonresponsive).
- d. Therapy - Clipping matted hair, clean the area, topical and systemic antibiotics and sometimes steroids.

4. **Parasitic Blepharitis**-- skin scrapings (rarely biopsy).

- a. Mange (Mites) - Demodex or Sarcoptes in dogs.
- b. Habronema - Equine.

5. **Mycotic blepharitis (Ringworm)**--Confirm by fungal culture.

- a. Not common, but can be seen periocularly, especially in puppies, kittens and calves.

6. **Allergic blepharitis**--Full Dermatologic work-up necessary.

- a. Allergic inhalant dermatitis (Atopy), is occasionally seen in dogs allergic to molds, pollens etc. These dogs almost always have other signs of allergies.
- b. Feline food allergies often have periocular crusting.

- c. Edema - insect bites, vaccine reactions etc.
 - d. Staphylococcus-similar to other skin lesions.
 - e. Drugs (topical aminoglycosides, systemic penicillins).
7. **Autoimmune complex**-poorly understood but does occur. Requires a full dermatologic work-up to diagnose.
 8. **Solar Blepharitis** (Sunburn) -- Clinical signs can suggest the diagnosis. A biopsy may rule out other etiologies.
 - a. Any species with little eyelid pigment. May predispose to squamous cell carcinoma.
 9. **Photosensitization** - Results in blepharodema and blepharitis. May be seen with tetracyclines, phenothiazines, ingestion of certain plants and fungi, toxins, and liver dysfunction in ruminants.
- F. Traumatic Disorders of the Eyelid**-- Should be repaired quickly, atraumatically, in two layers with minimal debridement.
1. Treat as an urgent case because early repair, prior to secondary bacterial infection and necrosis, provides the most functional and cosmetic result.
 2. Lids heal rapidly because they are well vascularized.
 3. V-plasty closure technique can often be used. Be sure to close the conjunctiva and skin, and be sure all suture is buried with none exposed to the cornea.
- G. Neoplastic Disorders of the Eyelids**--Fairly common, especially in older animals.
1. **Dog** -- Eyelid tumors are **almost always benign**
 - a. **Sebaceous adenoma** - very common.
 - b. **Sebaceous adenocarcinoma** (benign behavior-only locally invasive - no metastasis) a and b usually involve the meibomian gland(s) and may or may not have a chalazion associated with them. Surgical excision or cryosurgery are both effective.
 - c. **Papilloma** - may spontaneously regress. Surgically excise if are irritating.
 - d. **Histiocytomas** - may spontaneously regress or may need removal.
 - e. **Melanoma** - usually benign, surgical excision usually curative.

2. **Cat** -- Eyelid tumors are **often malignant**.
 - a. **Squamous cell carcinoma** -- often white cats. Surgical excision, cryosurgery, chemotherapy, and radiation therapy have been advocated for these lesions.
 - b. **Other** neoplasms.
3. **Horse** -- Eyelid tumors **often are malignant or locally invasive**. See the equine lecture.
 - a. **Sarcoid** - Most common periocular neoplasm in the horse.
 - b. **Squamous cell carcinoma**.
 - c. **Viral papillomas** affect both young and old horses and may spontaneously regress.
4. **Cattle** -- Eyelid tumors are **usually malignant**.
 - a. **Squamous cell carcinoma** - common, especially in breeds with little peri-ocular pigment such as Herefords.
 - b. **Lymphosarcoma** will occasionally infiltrate the lids.
5. **Therapy** of lid tumors in general
 - a. Multiple modalities including surgical excision, cryosurgery, immunotherapy, chemotherapy, hyperthermia and radiation therapy. Depending on the condition either a single or multimode approach can be taken.
 - b. If less than one-third the length of the lid margin is removed surgically, a V-Plasty (see surgery manual) will suffice. When more than one-third is to be removed other reconstructive procedures are needed.
 - c. Lid tumors should be removed if:
 - 1) They are approaching 1/4 to 1/3 of the lid length.
 - 2) There is concern over malignancy.
 - 3) Corneal or conjunctival irritation exists.
 - 4) The mass is being traumatized or is bleeding.
 - 5) The owner desires a more cosmetic appearance.