The eyelids of domestic animals have many important functions. They are important in protecting the globe, contributing to and spreading the tear film, and preventing the buildup of ocular pathogens and environmental debris. This article will review the basics of eyelid anatomy and function as well as discuss common problems associated with these structures.

The eyelids near the margin are thought to be composed of four primary layers: the conjunctiva, the tarsus and stroma, the orbicularis oculi muscle, and the dermis/epidermis. The margin is a mucocutaneous junction that connects the conjunctiva on the bulbar surface with the haired skin of the external surface. The primary muscle involved in eyelid closure is the circumferential orbicularis oculi muscle, innervated by the facial nerve (CN VII). The primary muscle involved in opening of the eyelid is the levator palpebrae superioris innervated by the oculomotor nerve (CN III). The tarsus (stroma) is comprised of connective tissue, levator muscles, and the tarsal or meibomian glands. These glands secrete the lipid component of the tear film and the openings for the secretory ducts are visible along the eyelid margin. The palpebral conjunctiva is the smooth, inner lining of the eyelid. It is continuous with the bulbar conjunctiva and contains lymphoid follicles, goblet cells (secrete the mucous portion of the tear film) and lymphatics.

Congenital abnormalities of the eyelids are occasionally seen in both dogs and cats. Physiologic ankyloblepharon is typically present until 10-14 days after birth. Premature opening of the palpebral fissure can result in severe ulceration since the lacrimal tissue is not fully developed. Ophthalmia neonatorum is a condition where a bacterium, often a staphylococcus, gains access to the conjunctival sac and results in purulent material building up beneath the closed eyelids. The eyelids must be opened in this case, by gentle massage if possible or scissors if necessary. The globe and conjunctiva should be aggressively flushed and topical antibiotics ocular lubricants used frequently. Eyelid aplasia (agenesis) is a condition where a portion of the eyelid margin fails to form. This is most common in cats and typically involves the lateral dorsal eyelid. Other congenital anomalies are often associated with this condition. Various reconstructive surgical techniques have been described, depending on the severity of the defect. Dermoids are ectopic islands of skin that develop at abnormal locations. They can be present along the eyelid margin, palpebral or bulbar conjunctiva, or the cornea. Surgical excision is curative.

Eyelid cilia and aberrant hair abnormalities are common in dogs. Distichia are hairs emerging from the meibomian gland openings and are oriented parallel to the corneal surface. They arise from undifferentiated portions of the meibomian glands. The clinical significance varies. Many dogs have multiple distichia that cause no clinical signs. The vast majority of cocker spaniels have multiple fine distichia, but treatment is rarely needed. Distichia that result in clinical signs are typically shorter, stiffer hairs. These commonly result in excessive lacrimation and epiphora, blepharospasm, and corneal ulceration. Various treatment options are available. Manual epilation can be used in cases of few distichia to determine if the clinical signs are actually due to the hairs. The hairs will regrow in most cases necessitating a more permanent option. Common techniques include electrolysis, electrocautery, cryotherapy, CO2 laser ablation, and surgical resection of the distal tarsal plate. Of these, I prefer cryotherapy, especially in cases of multiple hairs. This technique is effective at destroying the hair follicle without damaging the eyelid margin. Some temporary swelling and depigmentation of the margin is common however. Laser ablation and electrolysis are useful where there are few offending hairs. Ectopic cilia are a completely different matter. In most cases, this involves a single cilium emerging from the palpebral conjunctiva and oriented perpendicular to the cornea. These are typically seen in young dogs (rarely over 2 years old) and cause severe blepharospasm and lacrimation. A corneal ulcer that is unresponsive to medical therapy is often present. They are most commonly present in the center of the dorsal eyelid, several millimeters from the margin. They are most damaging and painful when they first emerge from the conjunctiva and act like little spikes rubbing on the cornea each time the dog blinks. Unfortunately, this is also when they are the most difficult to find, and often cannot be seen without magnification. Treatment involves removal of the cilium, either through direct excision or laser ablation, followed by cryotherapy of the eyelid to destroy the follicle.

Entropion is another common condition in dogs. In this condition, a portion of the eyelid is inverted such that the normal eyelid skin and hair makes contact with the cornea. This is usually a congenital or hereditary condition and typically requires surgical correction. There are several common exceptions. Pugs and Pekingese very commonly have a mild entropion of the medial lower eyelid. This often results in pigmentation of the medial cornea in these breeds, but typically does not cause signs of discomfort. Permanent surgery is not recommended in young puppies for several reasons. Some dogs may grow out of the condition as they age due to differences in the speed of development between the skull and skin. Furthermore, any permanent correction performed at too early an age may prove to be excessive or insufficient as the dog grows, necessitating a second surgery. In these cases, temporary eyelid tacking with either suture or surgical staples is effective at keeping the eyelid margin away from the cornea as the dog grows. Multiple tacking procedures may be necessary until the dog is old enough for surgery. Eyelid tacking is also useful in treating spastic...
entropion, a form of secondary entropion induced by a primary corneal injury or irritation. Relieving the eyelid contact with the cornea will allow the initiating corneal injury to heal and the eyelid will then return to a normal position. Surgery for entropion involves the removal of skin in appropriate areas to evert the eyelid margin. This is typically done by the Hotz-Celsus procedure. A strip of skin and orbicularis parallel to the margin in the affected area is removed and the edges sutured. It is important with this procedure to stay close to the margin (2-3mm) to minimize scar and ensure that sufficient eversion will occur. Removing too wide a strip of skin may result in cicatricial entropion which can be unsightly and difficult to correct. Therefore, it is best to err on the side of caution and aim for the desired amount or slightly less. It is easier to remove more skin at a later date than to attempt to fix an overcorrected eyelid. The skin is sutured with 5-0 to 7-0 suture in an interrupted pattern, making sure the knots are a sufficient distance from the cornea. Many modifications of this surgery have been described depending on the location of the affected eyelid. Often, a full thickness wedge resection is combined with the Hotz-Celsus procedure. Many forms of hereditary entropion result from excessive length of the eyelid and thus benefit from shortening. I perform the wedge resection near the lateral canthus prior to the Hotz-Celsus and have obtained good results with this combination. Important with any eyelid margin resection techniques is precise apposition of the margin upon closure. This is achieved with a 2 layer closure involving an absorbable conjunctival layer and non-absorbable skin layer with a figure-8 suture at the margin.

Ectropion is the eversion of a portion of the eyelid away from the cornea such that there is excessive exposure of the conjunctiva. Surgery is often not necessary for this condition, except in severe forms, such as with severe macroblepharon in Mastiffs, St. Bernard’s, and Bloodhounds. In these cases, a simple wedge resection of the everted areas is effective at improving the dog’s comfort and reducing chronic conjunctival exposure. Cicatricial entropion can result from overcorrected entropion surgery or trauma. This is typically corrected with a V → Y plasty but can be difficult due to significant fibrosis of the eyelid stroma. In most cases of mild ectropion, as is often seen in English bulldogs, surgical correction is not needed. The everted eyelid may result in increased conjunctival irritation and mucoid discharge due to environmental debris collecting in the ventral conjunctival sac. Treatment with topical corticosteroids is often helpful.

Macrolepharon is an oversized palpebral fissure. In brachycephalic breeds, this results in the “bulgy” eye appearance. As mentioned earlier, these dogs can have several abnormalities, including lower eyelid medial entropion, lagophthalmos and pigmentary keratitis. A permanent medial or lateral tarsorrhaphy is a common procedure for reducing the palpebral fissure length and improve eyelid coverage of the cornea. Lateral tarsorrhaphies are technically easier to perform but medial procedures result in a better cosmetic appearance. There is risk of damage to the nasolacrimal duct with medial procedures. While multiple surgical techniques have been described for shortening the palpebral fissure, I find the simplest technique the most effective and efficient. For a medial tarsorrhaphy, the eyelid margin and medial canthus are excised to a point 1-2 mm from the nasolacrimal puncta. A 2 layer closure using absorbable suture for the conjunctiva and nylon for the skin is performed. As always, careful apposition of the margin with a figure 8 suture is important. To relieve tension on the sutures, one or two temporary tarsorrhaphy sutures through the eyelid margin just lateral to the figure 8 suture is recommended and left in place for several weeks.

Trichiasis is a condition involving abnormal deviation of normal eyelid hairs. This is distinguished from entropion by observing the eyelid margin making normal contact with the cornea behind the offending hairs. I have seen this as a hereditary condition in some young dogs as well as an aging change due to loss of eyelid connective tissue in some older dogs. Nasal fold trichiasis is also common in brachycephalic breeds. Treatment is by excision of the affected skin and hair. Often this is performed as a Hotz-Celsus procedure, as for entropion. Severe trichiasis has been treated with excision of the affected skin and the wound left to heal by second intention. I have also utilized the CO2 laser to ablate the affected area in mild cases.

Blepharitis is inflammation of the eyelid tissue. There are multiple potential etiologies, including bacteria, fungi, parasites, and autoimmune. Bacterial blepharitis due to Staphylococcus or Streptococcus hypersensitivity results in significant swelling and ulceration of the eyelid and purulent discharge. Topical and systemic antibiotics are usually effective. Autoimmune blepharitis commonly involves perilocular alopecia and crusting, depigmentation and ulceration of the mucocutaneous junctions, and eyelid swelling. Often all four eyelids are affected, but this may be variable. Lymphocytes and plasma cells on histopathology suggest this etiology. Topical and systemic corticosteroids are usually effective, and I will sometimes add azathioprine to reduce the amount of systemic prednisone that is necessary long term. Oral cyclosporine may also be beneficial.

Chalazia are smooth, tan colored swellings along the palpebral conjunctiva near the margin. They are inflammatory swellings that result from meibomian secretions leaking into the surrounding tissue. They are a common incidental finding and treatment is rarely necessary. They can grow to be large and irritating to the cornea in some cases. Treatment involves in incision in the chalazion with a scalpel or CO2 laser and curettage. Topical antibiotics are used after surgery. In cases of multiple chalazia, there may be signs of qualitative tear deficiency due to a lack of the lipid component of the tear film. A Schirmer Tear Test would be normal, but fluorescein would reveal that the tear film breaks up sooner than it should. Clinical signs similar to KCS (pigmentary and vascular keratitis, mucoid discharge, dull corneal appearance) may be present.
Eyelid neoplasms are very common in the dog. Fortunately, the vast majority of these tumors are benign in this species, with meibomian adenomas and papillomas among the most common. Multiple tumor types have been reported in the eyelid, however, including melanoma, adenocarcinoma, squamous cell carcinoma, and basal cell carcinomas. Histiocytomas are seen occasionally in young dogs as a smooth, pink mass on the skin surface. Fortunately, most masses are easily biopsied for definitive diagnosis. For typical eyelid masses that appear to arise from the meibomian glands, several options are available. CO₂ laser ablation of the mass is a technique that is increasing in popularity. It can be performed from the palpebral conjunctival surface often with little or no disruption of the eyelid margin. Sutures are not necessary and the cosmetic result is excellent. Regrowth of the mass may occur all of the neoplastic tissue is not destroyed. Cryotherapy has also proven effective with some tumors. Simple wedge resection is also an effective technique, as long as the mass is no more than one third of the eyelid length. It is recommended that the V shaped wedge is twice as long as the base is wide to achieve the best cosmetic results. Larger tumors will require one of several reconstructive blepharoplasty techniques to fill in the resultant eyelid defect. In cats, eyelid neoplasms are usually malignant. Complete excision with complete margins is recommended in this species.
The glaucomas are a group of conditions in dogs characterized by increased intraocular pressure and progressive optic nerve and retinal degeneration. This can be one of the most devastating and frustrating ophthalmic conditions, both for the general practitioner and the ophthalmologist. This article will discuss the current clinical understanding of glaucoma and the treatment options.

Glaucoma can be either a primary or a secondary condition, and the distinction is critical for proper management. Secondary glaucoma is an increase in intraocular pressure that is a direct consequence of a pre-existing condition, such as chronic uveitis, lens luxation, trauma, hyphema, or developmental anomalies. This form of glaucoma can occur in any breed and at any age. Treatment is primarily aimed at correcting the underlying abnormality. Primary glaucoma occurs as a genetic condition due to the structural anatomy of the iridocorneal angle and the ciliary cleft. This is a bilateral disease, although it typically affects each eye at different times, and it will be the primary focus of this article.

A basic understanding of the physiology of aqueous humor production and outflow is required to understand glaucoma and the relevant treatments. Aqueous is produced in the ciliary body, specifically the non-pigmented epithelium. The majority of the aqueous flows through the pupil and exits the eye through the iridocorneal angle, where it must pass through the pectinate ligaments and trabecular meshwork before entering the angular aqueous plexus. This plexus joins with the intrascleral venous plexus which then leads to the vortex venous plexus for passage out of the eye. An alternative pathway for aqueous drainage is referred to as the unconventional or uveoscleral pathway. Aqueous passes directly through the iris stroma into the suprachoroidal space and out through the choroidal veins. The significance of this pathway varies with the species (dog – 15%, cat – 3%). Glaucoma in dogs is almost exclusively due to decreased aqueous outflow. A “sink” analogy where the drain is clogged works well to describe what is happening with glaucoma.

Signalment is very important in identifying primary glaucoma. While it has been observed in many breeds, certain breeds, such as Cocker Spaniels, Shar-Peis, Chow Chows, Siberian Huskies, Basset Hounds, and Beagles are afflicted with much greater frequency. Females are more affected than males, on balance, and most are middle aged (5-7 years old). Clinical sign recognition is also important. True glaucoma is nearly always associated with some combination of clinical signs, including scleral injection, diffuse corneal edema, elevated third eyelid, mydriasis, blepharospasm, buphthalmos, corneal striae, or vision loss. If an elevated tonometry value is obtained without any of the above clinical signs, the restraint and tonometry techniques should be evaluated as falsely elevated pressures are the common focus of improper techniques.

Buphthalmos is an exclusive sign of chronic glaucoma in adult dogs, but this is often confused with exophthalmos. The latter is anterior globe displacement due to a space occupying orbital mass or orbital inflammation. The globe is typically normal in most ways apart from being anteriorly displaced. There is typically minimal scleral injection, a normal cornea, normal PLR, and normal visual reflexes. The third eyelid is elevated and there is a reduced ability to retropulse the globe. Ophthalmoscopy may reveal a scleral indentation which confirms an orbital lesion. If there is still doubt, the horizontal diameter of the cornea can be measured with calipers and compared to the fellow eye.

Other diagnostic tests utilized in the ophthalmic examination include a menace response, dazzle reflex (bright light used to elicit a blink), pupillary light reflex, assessment of resting pupil size, and tonometry. It is important to remember that these tests are not perfect for evaluating the presence of vision as some normally visual dogs may not have a positive menace or dazzle, especially if they are stressed. Gonioscopy (evaluation of the iridocorneal angle) can be performed on the contralateral eye to assess the anatomic predisposition to developing glaucoma. This test is generally only performed by ophthalmologists.

Tonometry is the main diagnostic tool for diagnosing glaucoma, but it is important to remember the limitations and potential sources of error of this test, regardless of which instrument is used. Several things should be noted prior to taking a reading that could influence the interpretation. First, the dog’s emotional state is important. A dog that is overly stressed and worked up can have a falsely elevated pressure. Second, the restraint technique is very important. Ideally, there should be minimal restraint and the dog should be calm. Excessive pressure around the neck or eyelids can elevate the tonometry reading. Third, the health of the cornea can affect the reading. Tonometers are indirect measures of intraocular pressure and are calibrated based on normal corneal structure and firmness. Excessive cornea fibrosis, as with advanced keratoconjunctivitis sicca, or severe corneal edema may affect the measurement. The Tonopen® (Mentor) is the most commonly used instrument in general practice today and is very accurate when used correctly. It is an application tonometer that estimates the intraocular pressure based on the amount of pressure required to flatten a given area of the cornea. After application of topical anesthesia, the tip of the instrument is brought toward the center of the cornea (or the most “normal” area if significant corneal pathology is present). The tip must be perpendicular to the corneal surface and should make VERY LIGHT contact. If the cornea visibly indents when the tip makes contact, there is a chance of a falsely
conjunctival hyperemia and diffuse corneal edema. The pupil is dilated and the optic nerve may be swollen and gray. Acute such as blepharospasm, vocalizing upon palpation around the eye, and third eyelid elevation. There is typically intense scleral and time throughout the day sleeping. Conversely, dogs in an acute glaucoma episode typically display more outward signs of discomfort such as blepharospasm, vocalizing upon palpation around the eye, and third eyelid elevation. There is typically intense scleral and conjunctival hyperemia and diffuse corneal edema. The pupil is dilated and the optic nerve may be swollen and gray. Acute glaucoma represents a true emergency situation and must be treated aggressively if vision is to be saved.

There are several classes of medications used for glaucoma management. Miotics, such as pilocarpine and demecarium bromide, help to increase aqueous outflow by opening the iridocorneal angle and the ciliary cleft. Beta blockers, such as timolol and betaxolol, decrease aqueous formation at the ciliary body by an unknown mechanism. These classes of medications have the benefit of being affordable and effective in mild cases of glaucoma. Carbonic anhydrase inhibitors (CAI) are a commonly used class of drugs. They decrease aqueous humor production by inhibiting the enzyme catalyst in the production of bicarbonate. Oral varieties of this class, such as acetazolamide and methazolamide, have been in use for many years. While effective, there are multiple systemic side effects possible, especially at the higher doses, including metabolic acidosis, diuresis, and GI upset. Topical CAIs include dorzolamide and brinzolamide. These medications have been shown to be as effective as the oral varieties without the potential side effects. Prostaglandin analogues represent the newest and most promising class. Latanoprost, travaprost, and bimatoprost are several commonly used examples of this class. These drugs can have dramatic hypotensive effects at a once or twice daily dosing in dogs, but have been shown to have minimal effects in cats. However, a recent study suggested they have a greater effect on lowering ocular pressure in glaucomatous eyes than in normotensive eyes. The primary mode of action is to increase uveoscleral outflow of aqueous by modifying the extracellular matrix in the ciliary muscle. They also have potent miotic effects in dogs and cats which may increase conventional outflow. These are excellent drugs to use in an emergency situation with acute primary glaucoma. Due to their miotic effect, they should be used with caution in eyes with significant uveitis and avoided in eyes with an anterior lens luxation. In many dogs with primary glaucoma, combinations of medications may be required to maintain the intraocular pressure in the desired range (10-15 mmHg). I treat aggressively at first and frequently recheck the pressure to titrate the medication to the desired effect. Prophylactic treatment of the normotensive eye is important in attempting to delay the onset of glaucoma and preserve vision. At least one study has shown that several different medications are effective in significantly delaying the onset of glaucoma when compared to untreated animals.

Hyperosmotic agents are commonly used medications, primarily in emergency situations. They are systemic medications that work by increasing the plasma osmolality, resulting in a flow of water from the intraocular compartments to the blood by diffusion. This results in decreased vitreous volume and posterior displacement of the lens which opens the iridocorneal angle. They will not be effective in cases of secondary glaucoma due to uveitis. Mannitol is the most common example. It is given by intravenously at a dose of 1-2 g/kg over 20-30 minutes. Water should be withheld for at least 4 hours after administration. Glycerin is another example and can be given orally 1-2 g/kg. Vomiting is common, especially if it is given too fast or at higher doses.

There are several surgical options for glaucoma. Too often, surgery is discussed in glaucoma only after vision has been lost and the animal is in discomfort from the uncontrolled glaucoma. Several options exist for this situation, including enucleation, intracocular prosthetic, cyclocryothermy, or chemical ciliary body ablation using intravitreal gentamicin or cidofovir. The goal of all of these procedures is to improve the patient’s comfort and eliminate the need for chronic, expensive medications. In eyes that are potentially visual, several other surgical options exist. The most common and widespread procedure is cyclophotocoagulation using a diode laser. This procedure targets the ciliary body processes to decrease aqueous production. Until recently, the most common technique involved the use of a transscleral probe placed 3-4 mm behind the limbus. In recent years, endoscopic cyclophotocoagulation has become available, allowing more precise targeting of the ciliary processes. With this technique, the lens is typically removed by phacoemulsification to allow room for the combined endoscope-laser probe. The ciliary processes are visualized and the coagulation effect of the laser can be observed and adjusted to achieve the desired effect. While clinicians performing this procedure are reporting positive results with many patients remaining visual for years, this is still a new and evolving technique. Other laser options, including transscleral micropulse therapy, are currently being investigated and are very promising. Goniovalve implantation has been used for many years in people, but has historically had poor long term success rates in dogs due to conjunctival fibrosis around the shunt.
However, a recent study suggested that the majority of patients can maintain vision and low intraocular pressures for over a year with valve placement and this option may become more commonplace.

Unfortunately, most eyes with glaucoma ultimately lose vision, despite aggressive medical and surgical treatments. However, continual advances in medical and surgical options are expanding our tools to fight this frustrating disease and allowing us to preserve vision for increasingly extended periods of time.
The crystalline lens is a remarkable structure. As with the cornea, nature found a way to arrange living cells such into an optically transparent structure. The purpose of the lens is to serve as a final focus of light entering the eye onto the retina and to accommodate focus for near and far images. This discussion will focus on the normal anatomy and development of the canine lens as well as the most common clinical conditions affecting the lens.

The lens develops from surface ectoderm cells that grow inward to form the lens placode. The orientation of the lens depends on the proximity to the developing retina; cells nearest the retina become the primary lens fibers whereas the opposite cells form the mitotically active lens epithelial cells. The primary lens fibers become the embryonic nucleus, the most central cells in the lens. Lens epithelial cells produce new lens cells at the equator which become the lens cortex. These new cortex cells become very elongated and lose their nucleus and most of their organelles. They extend to join other lens fiber cells, forming the lens sutures where they meet. The sutures are visible on ophthalmic exam as a “Y” anteriorly and an inverted “Y” posteriorly. The fully developed lens contains several distinct layers. Starting from the outside, they are the lens capsule, the anterior lens epithelium, the cortex, and the nucleus. The nucleus can be subdivided into an adult, fetal, and embryonic nucleus. The ability to localize abnormalities to a specific layer of the lens can be helpful in determining cause and the potential for progression. The lens is suspended in place by tiny strands extending from the ciliary processes and attaching to the equatorial lens capsule. These strands, known as zonules, can degenerate as a hereditary condition in some breeds, most notably terriers, and result in a lens luxation.

As stated earlier, the function of the lens is to focus incoming light on to the retina. Despite being significantly thicker than the cornea, it is not as effective at bending light rays. Light rays change direction when they enter a medium with a different refractive index. The greater the difference in the refractive index between two media, the more light will bend as it passes through them. The refractive index difference between air and the pre-corneal tear film is significantly different, while the difference between lens cells and the surrounding aqueous and vitreous is relatively small. Thus, the lens exists to provide fine focus. It is also plays a critical role in changing the depth of focus, a process called accommodation. In many species, such as humans, primates, and birds, the lens is quite soft and changes shape easily to change the degree to which the light is bent. The light from near objects must be bent more than that from distant objects to focus on the retina, so the lens becomes more spherical. It then becomes more disc shaped for distance viewing. Dogs and cats have a much reduced ability to alter their lens curvature. It is thought that they accommodate primarily through anterior and posterior translocation of the lens.

Cataracts are the most common clinical problem seen with the lens. Simply, a cataract is any opacity of the lens or lens capsule that can block or distort light. There are multiple ways to classify cataracts: density, location, shape, age of onset, and etiology. Some cataracts, especially those confined to the nucleus or which have a classic hereditary shape, do not progress to cause vision defects. In these cases, no treatment or surgery is needed. Most cataracts, however, will progress at some point. Genetic cataracts are commonly seen. Although many breeds commonly develop hereditary cataracts, among the more common are Boston Terriers, Pugs, Cocker Spaniels, Shih Tzus, miniature Poodles, and Siberian Huskies.

The treatment option selected depends on many factors, including the level of vision compromise, presence of lens induced uveitis, age and health of the patient, and financial considerations. While surgery is the most effective option for most cataracts, medical options do exist. Topical anti-inflammatory therapy on a long term basis with steroids or NSAIDs is effective at reducing lens induced uveitis and limiting the risk of secondary glaucoma. While this option does not improve vision or treat the cataract, it is useful to help maintain patient comfort. In the last few years, medications containing the ingredient n-acetyl carnosine have appeared on the market. This compound has been shown to cause disaggregation of lens crystallins in select circumstances in-vitro. A preliminary study in 2006 showed there was in fact some reduction in the density of most cataracts, although it was only significant with immature cataracts and dogs with nuclear sclerosis from age. 80% of owners felt there was an improvement in visual acuity, however. While this sounds great, there has been little additional research on veterinary patients since then. Furthermore, my personal experience with these medications has not been encouraging. I have seen little, if any, reduction of the density of cataracts with any of the patients I have tried them on. Still, they are available and may be an alternative to surgery in some cases.

Surgical removal of the lens is the best way to remove the cataract and restore vision. Phacoemulsification is the current standard for this procedure. This procedure allows removal of the lens through an incision less than 5 mm. The handpiece and attached needle performs 3 functions simultaneously: irrigation, phacoemulsification, and aspiration. The irrigation fluids maintain the intraocular pressure and help to cool the needle tip and prevent thermal injury. Phacoemulsification is the use of ultrasound energy to break up the cataract. This is achieved by rapid vibration of the needle tip. Finally, the lens fragments are aspirated through the lumen of the
needle. Following removal of the lens, insertion of an artificial lens into the lens capsule allows for more natural post-operative vision. There are multiple lens designs; however all are made with the same dioptic strength: 41.5 D for dogs and 53 D for cats. These are considerably more powerful than is normal for human intraocular lenses. Acrylic foldable lenses are used by most ophthalmologists currently as they allow the incision size to remain small. Post-operative vision is considered normal by owners of patients that received a lens implant (pseudophakic). Aphakic animals (no lens implant) have adequate vision for maneuvering through their environment; however they are extremely hyperopic (far sighted).

Improved techniques and technology have contributed to greatly increased success rates over the years. Currently, it is estimated that 90-95% of patients will be comfortable and visual at 1 year after surgery. Several complications can occur, both in the short and long term. Glaucoma is the most common problem and can be blinding and uncomfortable for the patient if not aggressively treated. Retinal detachments are also seen occasionally. Other complications include corneal ulcers, persistent uveitis, capsular fibrosis, and endophthalmitis (rare). Regrowth of the cataract is not a concern following this surgery, however capsular fibrosis can become quite dense in some patients and possibly begin to restrict vision again. To minimize the risk for these complications, I treat with long term topical anti-inflammatory medications, either steroids or NSAIDs. This is true for cataract patients that do not opt for surgery as well as long term lens induced uveitis can lead to the same debilitating complications as are seen with surgery.

Lens luxation is another condition affecting the lens commonly seen by the ophthalmologist. This is almost exclusively a hereditary condition, although severe trauma or an intraocular neoplasm may also cause it to occur. It is seen most frequently in terrier breeds, shar peis, and border collies. It is caused by a progressive degeneration of the lens zonules that suspend the lens in place. Early warning signs of lens instability include vitreous herniation into the anterior chamber (visible as wispy, gray material) or phacodenesis (visible movement of the lens whenever the eye moves). An aphakic crescent is the classic sign of a posterior lens luxation. While not every patient with early warning signs will develop a complete luxation of the lens, it is important to advise the owner of the risks and consider treatment or referral to an ophthalmologist for evaluation. When a lens does luxate, it will either fall to the ventral posterior segment or move forward into the anterior chamber. Both conditions result in a high risk of vision loss through glaucoma and/or retinal detachment, however anterior luxations are much more concerning in the acute stage. These patients often develop a pupillary block glaucoma from the lens obstructing normal flow of aqueous humor through the pupil into the anterior chamber. These patients are acutely painful and typically present with a cloudy eye and very injected episcleral vessels. Occasionally, the luxated lens can be difficult to identify, especially if it is clear. It is helpful to look at the eye from different angles, ideally with a narrow beam of light. Although often unsuccessful, an attempt can be made to dilate the iris and apply pressure to the cornea in the hopes of pushing the lens back behind the iris. In most cases, surgical removal of the lens is needed to prevent or control glaucoma before vision is lost. This procedure is called an intracapsular lens extraction and involves a large corneal incision just inside the dorsal limbus. The lens and its capsule are removed together in one piece through the incision. Most patients are left aphakic and can function well as discussed earlier. A technique has been described to suture artificial lenses in place after this procedure, however there is a significant risk of bleeding and I have not attempted this yet. Glaucoma and retinal detachments are the main complications reported with this surgery, as with phacoemulsification. A diode laser retinopexy is often recommended to limit the risk of retinal detachment. To have the best chance at avoiding complications, surgery should be performed before acute glaucoma and inflammation are present, thus the importance of early referral.