Understanding blindness in cats

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ABSTRACT

Blind cats can have a very happy and fulfilled life, with a little help from their owners and vet. The signs of blindness include a change in personality, a change in the appearance in the eye and the cat walking in a crouched position closer to the ground. Causes of blindness include systemic hypertension, cataracts, trauma, glaucoma, uveitis and birth defects. Caring for a blind cat depends on whether the blindness has been a gradual experience or sudden.

INTRODUCTION

Vision is an importance sense for cats, used for navigation, orientation, hunting and interaction with other cats. Loss of vision can occur due to disease, trauma, toxins or dietary deficiency. As vets, we need to provide rapid and accurate diagnosis, with appropriate treatment for the underlying condition, making the cat as comfortable as possible. However, it is also important to be able to provide support to the owners who will be upset for the cat and unsure how to care for them.

SIGNS OF BLINDNESS

The owners may present the cat for evaluation of vision loss because they have noticed changes in behaviour or changes to the appearance of the eyes. Their observations will include some of the following:

- The cat is walking in a crouched position, holding their body low to the ground
- Walking around the edge of the room or garden rather than through the middle
- The cat walks into things, such objects which are not normally in that position
- Reluctance to jump down, although they may be still able to jump onto things
- There may be a difference in the confidence of the cat depending on the lighting conditions – the cat may be

less confident in dim light
- The personality may change, with the cat being more quiet or fearful
- A change in the appearance of the eye – it may be red, cloudy or glazed
- There is an increased green shine to the eye, in other words, increased tapetal hyper-reflectivity and dilated pupils

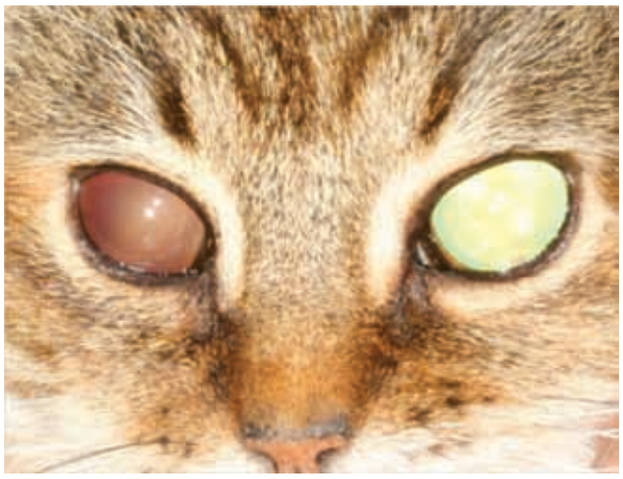


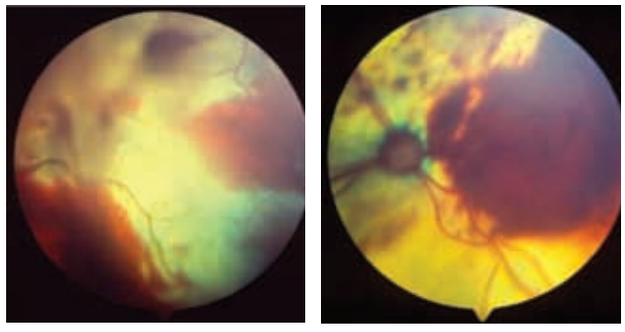
Figure 1. Hyphaema in the right eye and mydriasis and tapetal hyper-reflectivity in the left eye.

CAUSES OF BLINDNESS IN CATS

There are many different reasons why a cat may become blind, which may be considered when evaluating the blind cat. A full history, along with a thorough ocular and physical examination may reveal the cause or may lead to further diagnostic tests being indicated. The most common causes of blindness in cats are summarised:

1. Systemic hypertension

Hypertension is an under-diagnosed condition of older cats, and it is the most common cause of blindness. Typically, an older cat presents with blindness, widely dilated pupils, some blood in the anterior chamber or vitreous, and multifocal retinal haemorrhages, oedema and/or detachment (**figures 2 and 3**). The retinal changes are bilateral but not symmetrical. Hypertension may be primary, or secondary to systemic conditions including chronic renal disease, hyperthyroidism and hyperaldosteronism. Following treatment it is possible for the cat to regain some vision, but this depends on various factors – for example the length of time the retina is detached. Blood pressure should be measured (**Figure 4**), and, if the facilities are not available, the cat should be referred.



Figures 2 and 3. Both fundus photos show pre-retinal haemorrhage, bullous retinal detachment and blood vessel abnormalities in these cats suffering with systemic hypertension.

Figure 4. Measuring blood pressure in a cat using a Doppler ultrasound. The cat is gently restrained, and headphones are used to prevent sounds which may disturb the cat, falsely elevating the blood pressure.

2. Cataracts

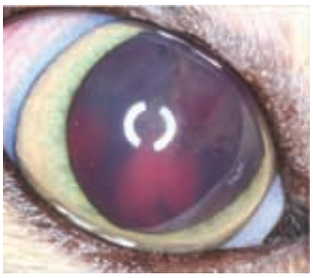
A cataract is an opacity of the lens. They are not very common in cats but most often occur as a result of penetrating lens injury or blunt trauma (**Figure 5**), secondary to uveitis (see below), or very occasionally they may be congenital (**Figure 6**). Recently, the parasite *Encephalitozoon cuniculi* has been implicated in the pathogenesis of feline cataracts. In some instances the cataracts may be suitable for surgical removal using phacoemulsification.

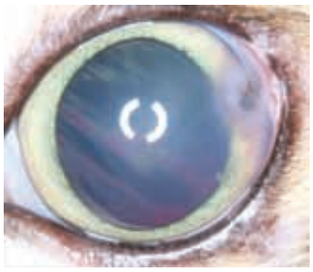
Figure 5. Hypermature cataract in the left eye presumed to be secondary to previous trauma, and evidence of previous trauma in the right eye also as there is a corneal scar and anterior synechia in this rescued cat.

Figure 6. Bilateral congenital cataracts in a one-year-old cat

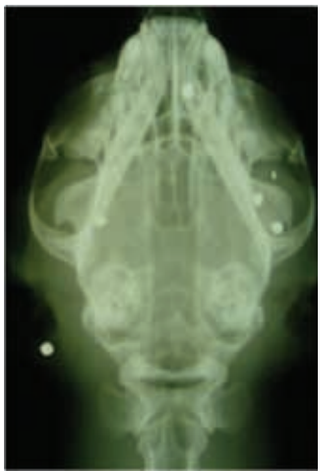
3. Trauma

Through a variety of mechanisms, ocular or head trauma can lead to blindness. The most common forms of injury a cat sustains are blunt trauma such as road traffic accidents, or sharp penetrating trauma such as cat claw injury or gun shot pellets (**Figures 7-10**). This can result in globe rupture, retinal detachment, lens luxation, cataract, hyphaema, and may lead to secondary glaucoma or phacoclastic uveitis. Hyphaema obscures the view of the internal structures of the eye, and can lead to secondary glaucoma or induce retinal detachment.





Figures 7 and 8. Left and right eye of a cat which went missing for a couple of days and returned blind. There was a corneal wound in the left eye along with vitreal haemorrhage, and a wound above the right eye along with vitreal haemorrhage.



Figures 9 and 10. Radiographs of the same cat featured in figures 7 and 8. It was clear that the misfortunate cat was the victim of a shot gun incident.

4. Glaucoma

Glaucoma is the result of raised intraocular pressure. An obstruction to the drainage of aqueous humour can result in increased pressure. The high pressure damages the delicate retinal ganglion cells and their axons, making vision poorer until it eventually causes blindness. Glaucoma in cats is most often caused by uveitis (see below). Other causes include trauma, hyphaema or ocular neoplasia. Even though glaucoma is a painful condition, the cat may display only subtle signs. There will be varying degrees of episcleral congestion, pupil dilation (**Figure 11**), poor pupillary light reflex (PLR) or hydrophthalmos (enlarged globe, **Figure 12**). The only reliable way to diagnose glaucoma is by tonometry. If glaucoma is suspected and the clinic does not have a tonometer, referral is advisable.

Figure 11. Episcleral congestion, precipitates on the corneal endothelium, iris hyperaemia, mydriasis and dyscoria in this cat with glaucoma secondary to uveitis.

Figure 12. The left eye is enlarged (hydrophthalmos), the cornea has scarring centrally, there is miosis and cataract in this cat with chronic glaucoma due to previous ocular trauma.

5. Uveitis

Uveitis is inflammation of the uveal tract, which comprises the iris, the ciliary body and the choroid. Anterior uveitis (inflammation of the iris) is the most common type of uveitis which is diagnosed. Signs of uveitis include conjunctival hyperaemia, moderate blepharospasm and epiphora, keratic precipitates on the ventral aspect of the corneal endothelium (**Figure 13**), fibrin in the anterior chamber (**Figure 14**), a change in iris colour (may become muddy brown or hyperaemic), and occasionally photophobia and corneal oedema. Causes of uveitis in cats include:

- trauma damaging the lens (phacoclastic uveitis)
- immune-mediated disease causing lymphocytic-plasmacytic uveitis
- infectious agents such as feline infectious peritonitis (FIP), toxoplasmosis, feline immunodeficiency virus (FIV), or feline leukaemia virus (FeLV).
- corneal disease including corneal ulcers can cause reflex trigeminal neuritis which manifests as uveitis.

Laboratory tests for an underlying cause are indicated, including haematology, biochemistry, urinalysis, FIV, FeLV, titres for corona virus and Toxoplasma IgG

Figure 13. There are multifocal opacities visible on the corneal endothelium which are keratic precipitates in this kitten with FIP.

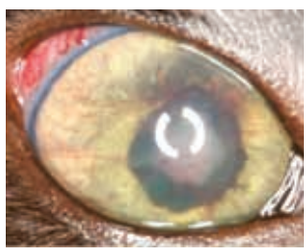


Figure 14. There is episcleral congestion, a fibrin clot in the anterior chamber, hyperaemia of the iris and dyscoria (distorted pupil) in this FIV-positive cat.

and IgM. Depending on clinical findings on physical examination, further diagnostic imaging may be warranted. Aqueocentesis samples may be obtained with extreme care for cytology and PCR. In some of these long-standing cases, uveitis can lead to cataracts or glaucoma, both of which cause eventual blindness.

6. Birth defects

Congenital microphthalmia can cause blindness, although some microphthalmic eyes have normal vision. In many cases, no underlying cause for congenital microphthalmia is found, although griseofulvin intake by a pregnant queen is a known cause. Occasionally, secondary entropion develops from the lack of support provided by the small eye, although in many cases the eyelids will be correspondingly short and not cause problems (**Figure 15**).

Figure 15. Evie was born with no eyes and very small eyelids. Her litter-mate was normal.

7. Corneal ulceration and endophthalmitis

Corneal ulcers which are not successfully treated may result in blindness due to corneal scarring or due to the consequences of severe intraocular inflammation or infection (**Figure 16**).

Figure 16. The right eye of this kitten developed a corneal ulcer which was left untreated, resulting in endophthalmitis.

8. Feline herpesvirus

There are several different ways in which FHV-1 can affect the eye, but those that can result in blindness include symblepharon (where the conjunctiva adheres to the cornea, **Figure 17**), stromal corneal ulceration and uveitis.

Figure 17. Symblepharon secondary to FHV-1 where the conjunctiva has adhered to the cornea making it opaque. The dorsal conjunctival fornix is obliterated with resulting ectropion of the upper eyelid, and there is a fixed, protruding third eyelid.

9. Ocular neoplasia

The most common primary ocular tumour in the cat is melanoma (**Figure 18**), and the most common secondary tumour is lymphoma. Both can cause secondary uveitis or glaucoma, which can lead to blindness. In some cases, a fine needle aspirate or biopsy might be possible, and in other cases enucleation is indicated to try to prevent metastasis and provide an opportunity for accurate histological diagnosis, which allows for the most appropriate treatment and prognosis. Early enucleation is considered with progressing melanoma, whereas fine needle aspirate would be more appropriate for lymphoma diagnosis.

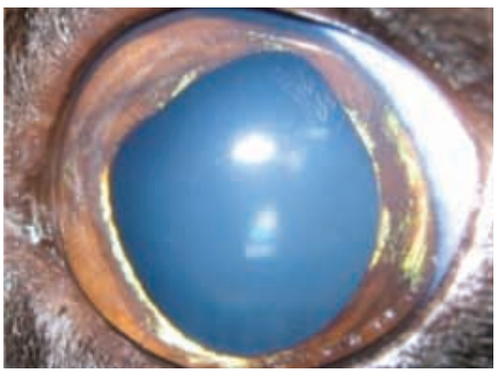


Figure 18. Diffuse iris melanoma – the iris, which was originally yellow, is thickened and heavily pigmented.

10. Retinal degeneration can occur as a result of dietary deficiencies, drugs/toxins, or inherited disease.

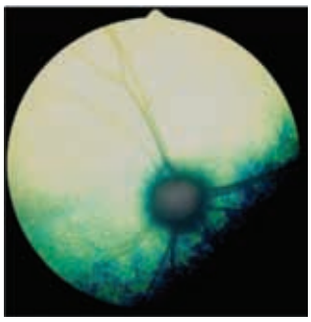
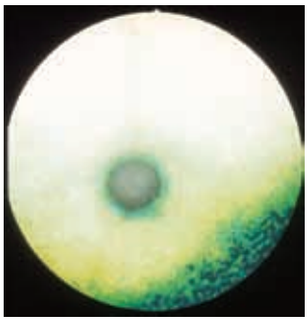
Signs usually include mydriasis and tapetal hyper-reflectivity, as well as blindness.

Cats require the amino acid taurine in their diet. As taurine is provided in all commercially prepared cat foods, taurine deficiency is fortunately rare. However, cats fed on dog food or homemade diets are at risk of becoming taurine deficient. Taurine deficiency causes cardiomyopathy, and a hyper-reflective lesion in the area centralis of the fundus (hence the old name feline central retinal degeneration), which progresses to a band shape above the optic nerve, and eventually leads to total retinal degeneration and blindness.

Enrofloxacin (Baytril, Bayer) has, in rare cases of accidental overdose, prolonged treatment or through an apparent idiosyncratic adverse reaction, caused retinal degeneration which has resulted in blindness (**Figures 19 and 20**).

This blindness can be temporary if the drug is withdrawn quickly but vision can also deteriorate further with time.

It is recommended to adhere closely to the data sheet recommendations when using this antibiotic in cats.

Figures 19 and 20. Fundus photographs of a cat which received 20mg/kg of Baytril for five days, and presented suddenly blind. Figure was taken one week post blindness and figure was the same eye taken five weeks later and shows much more advanced retinal degeneration. Photographs courtesy of David Gould, Davies Veterinary Specialists.

11. Progressive Retinal Atrophy (PRA)

PRA is an umbrella term for various forms of inherited retinal degenerations which progress to blindness. Retinal degeneration of the Abyssinian or Somali cat (RdAc) occurs due to a mutation in the CEP290 gene and is usually late in onset (three-to-five years). This form is also present in several other breeds, including the Siamese and domestic short-haired cat. Another type of PRA, rod cone dysplasia (Rdy) is due to a mutation in a different gene, CRX, and may cause blindness as early as at seven weeks of age in the Abyssinian and Somali cat. Cats with PRA have gradual sight loss, but this may be suddenly noticed as the disease is advanced. Typically tapetal hyper-reflectivity (**Figure 21**) and retinal vascular attenuation are pronounced by the time the cat is presented. There is no treatment for this condition, and it usually progresses to total blindness. There is a DNA test available for the two most common mutations known to cause this condition - rdAc (CEP290) and Rdy (CRX).

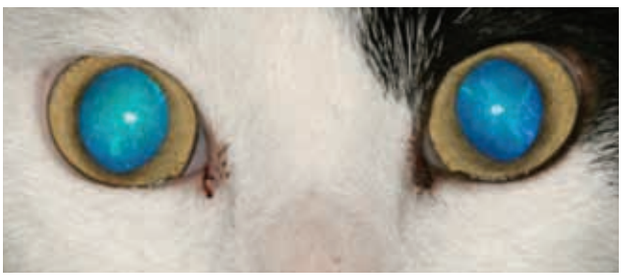


Figure 21. A cat with retinal degeneration showing tapetal hyper-reflectivity.

12. Central anoxia/hypoxia

Central anoxia/hypoxia (complete or partial lack of oxygen) occurs very rarely as a result of anaesthesia in cats and can result in blindness. Reduced blood supply or reduced oxygen supply to the brain during anaesthesia can cause damage to the visual cortex. In some cases, the damage is mild and the vision recovers. However, in more severe cases vision is permanently lost and sometimes other neurological problems are also present. Affected cats have fixed dilated pupils after recovering from anaesthesia and tend to be quite distressed by their sudden blindness. Fortunately, this complication is uncommon.

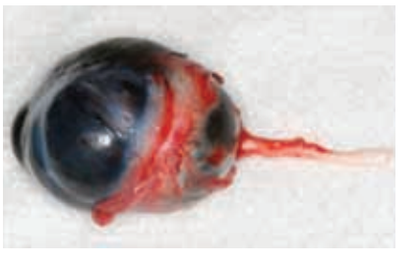


Figure 22. Enucleated globe from a cat. The enlarged eye was causing the cat problems due to an inability to blink, and was enucleated. However far too much optic nerve was removed with it.

13. Enucleation complication

The feline optic nerve is short, and excessive traction or twisting of the globe during enucleation can damage the contra-lateral optic nerve, through the optic chiasm. This can cause blindness in the remaining eye, and thus much care must be taken during surgery (see **Figure 22**).

ASSESSING THE BLIND CAT

1. Menace response – a threatening movement is made towards each eye in turn, taking care not to touch the patient or create a wind current. A normal response is a blink with aversion of the head, confirming vision and an intact facial nerve.
2. Tracking reflex – a laser light is rapidly moved on the floor or wall in front of the cat, or cotton wool balls are dropped from a height beside the cat. A normally sighted cat can't resist following the movement.
3. Visual placing – the cat is carried towards a table, if they see it they reach towards the surface before touching it.
4. Behaviour – the cat may bump into things, hesitate when jumping down, walk in a crouched position keeping low to the ground, walk around the edge of a room rather than straight through it, and use whiskers to feel the way.

The following tests are also very useful when assessing the blind cat, but they are not strictly vision tests.

5. Dazzle reflex – a strong light is briefly shone into each eye in turn, a normal response is a blink or partial blink and head aversion. A negative dazzle reflex confirms blindness.
6. Pupillary light reflex (PLR) – a bright light is shone into the lateral aspect of each eye in turn, and a normal response is constriction of the pupil being stimulated (direct response) along with slightly less constriction of the unstimulated pupil (consensual response). Blind cats can have a normal PLR despite advanced retinal disease, for example in the earlier stages of PRA.

CARING FOR A BLIND CAT

A cat that is suddenly blind may be stressed and confused, and therefore gentle handling and reassurance are needed. Cats that became gradually blind will already have adapted but the owner can still help to make life easier for them. The cat may be confident at home but more apprehensive when away, and it is important to realise that when dealing with them at the vets. They should not be left in a waiting room with barking dogs, but allowed to wait in a quiet area. Depending on the cat, they may feel more secure

being examined wrapped up in a towel, and they should be handled gently. When hospitalised, they should be in a quiet area, loud noises should be avoided, and they should be spoken to on approach to avoid startling them.

Cats with visual impairment function very well in familiar surroundings, and it is important to keep the lay-out of the home consistent. With sudden blindness, it is best to confine them to one room initially. They need to be provided with food, water, a bed and a litter tray. These should be spread out rather than being placed beside each other, as the cat may refuse to eat food which is placed beside the litter tray. They can gradually be allowed to explore more and more of the house. At this time, the food, water, bed and litter tray may be placed in more appropriate places but these should be kept consistent, as they provide a really useful reference point should the cat become disorientated at any stage.

A clean litter box should be provided, even if the cat is allowed outside. It allows them an opportunity to relieve themselves inside in a safe place should they feel anxious about venturing outside. It also is a useful point of reference as they will be able to smell it from quite a distance away. The garden can be enclosed to make the cat safe, or an outdoor enclosure can be constructed so that the blind cat can still enjoy being outdoors but in a safe and controlled environment.

Safety within the home can be improved by blocking potential hazards such as fireplaces, window ledges and balconies. Doors leading outside and all windows need to be kept closed, as the blind cat may still be very adventurous.

Most cats enjoy being up on a height, and this is still the same for blind cats. Although some learn to jump up onto favourite perching places, others no longer feel secure doing this. In this case, a ramp or low chair may help with access to favourite high resting places to make the climb easier. They should still be provided with scratching posts, and attention should be paid to their nails as they may become very long as the cat is less active and no longer has access to trees, etc. Many blind cats still love a cat gym and are able to play, rest and scratch on them.

It is important that the owner provides companionship by taking the time to interact with the cat, through stroking or playing. Most blind cats are surprisingly still very playful, and really enjoy stimulation with toys. Toys with bells or rattles are useful as the cat can follow them, and some cats also like cat-nip impregnated mice, or squeaking mice on elastic. Blind cats can have a very happy and fulfilled life, with a little help from their owners and support from the vet. It is important to continue to provide good nutrition and preventative health care as before. Re-examinations are essential to continue to treat the underlying cause of blindness, to monitor for complications such as glaucoma and to provide continuing support for the owners, to make the cats life as healthy and fulfilled as possible.

RESOURCES

'Caring for a blind cat' by Natasha Mitchell is a detailed technical guide which covers all of the topics discussed in this article in much greater detail and is available as an e-book or printed softback via *www.catprofessional.com*. There are also many blogs and websites which give advice about caring for a blind cat. The main cat rescue organisation is Blind Cat Rescue www.blindcatrescue.com

MULTIPLE CHOICE QUESTIONS:

1. DIFFERENTIALS FOR CAUSES OF FELINE SYSTEMIC HYPERTENSION INCLUDE:

a. Hypoaldosteronism
b. Chronic renal failure
c. Chronic hepatic failure
d. Hypoadrenocorticism

2. GLAUCOMA IN CATS MAY BE CAUSED BY:

a. Uveitis
b. Ocular neoplasia
c. Trauma
d. All of the above

3. ENUCLEATION COMPLICATIONS IN CATS INCLUDE:

a. Glaucoma
b. Systemic hypertension
c. Traction on the optic nerve blinding the fellow eye
d. Retinal degeneration

4. FELINE HERPESVIRUS-1 CAN RESULT IN OCULAR CHANGES INCLUDING:

a. Symblepharon
b. Corneal ulcers
c. Uveitis
d. All of the above

5. TESTS OF VISION INCLUDE:

a. Menace response
b. Dazzle reflex
c. Tracking reflex
d. Pupillary light reflex

Answers: 1: b, 2: c, 3: b, 4: d, 5: a & c