

AVIAN AND REPTILIAN OPHTHALMOLOGY

Panagiotis Azmanis
Dubai Falcon Hospital
22a Street, Zabeel 2, Dubai
United Arab Emirates

Ophthalmology in avian and reptilian species presents unique challenges due to significant anatomical, physiological, and pathological differences compared to mammalian systems. The avian eye is distinguished by its large size, scleral ossicles, and the **pecten oculi**, which necessitates specialized diagnostic and surgical approaches. Reptilian ophthalmology is further complicated by the immense diversity of the subphylum, with snakes possessing a fused eyelid or spectacle, while chelonians and lizards have movable eyelids. This review summarizes the fundamental anatomical features and discusses common ocular pathologies and diagnostic techniques relevant to clinical practice

Ophthalmoanatomy

The avian visual system is highly developed, reflecting the critical role of sight in flight, foraging, and survival. The avian eye is generally very large relative to the size of the head, and its shape can be **flat** (e.g., chickens), **globose** (e.g., parrots), or **tubular** (e.g., owls), which correlates with visual acuity and lifestyle.

Key Anatomical Features of the Avian Eye

- **Scleral Ossicles:** The sclera of the avian eye is supported by a ring of cartilaginous or bony plates known as scleral ossicles, which maintain the globe's shape.
- **Pecten Oculi:** A unique, highly vascular, accordion-like structure that projects from the optic nerve head into the vitreous humor. Its function is debated but is believed to play a role in nourishing the avascular retina, regulating intraocular pressure, and potentially reducing glare.
- **Nictitating Membrane:** A highly functional third eyelid that sweeps horizontally across the cornea, providing lubrication and protection without obscuring vision.
- **Retina:** The retina of many avian species, particularly raptors, contains a high density of photoreceptors and a **dual fovea**, allowing for exceptional visual acuity and a wide field of view.

In reptiles a crucial distinction is the presence of a **spectacle** in all snakes and some geckos. This is a fused, transparent eyelid that covers and protects the cornea. The spectacle is shed along with the rest of the skin (ecdysis) and is a key structure in understanding many ophidian diseases.

Key Anatomical Features of the Reptilian Eye

- **Spectacle:** In snakes, the spectacle is a clear scale that covers the eye, and the tear fluid lubricates the space between the spectacle and the cornea. The **nasolacrimal duct** is absent in most snakes, with tears draining into the oral cavity. Iguanas have a third "eye".
- **Eyelids:** Most lizards, chelonians (turtles and tortoises), and crocodilians possess movable upper and lower eyelids and a nictitating membrane.
- **Retina:** Many diurnal lizards possess a cone-rich retina, while nocturnal species have a rod-rich retina, while some species possess **dual fovea** similar to birds.

Ocular examination and Diagnostic Techniques

A thorough ophthalmic examination in avian and reptilian patients requires species-specific knowledge. It should be reminded that many of the ocular conditions might be related to husbandry deficiencies or systemic disease. Therefore, it would be prudent to examine fully the patient and not just focusing on the eyes.

Examination starts with proper history, distant observation without handling and proceeds to a more specific ocular examination by gently restraining the head. Periocular structures are often affected and mistaken as globe ocular pathology.

- **Ophthalmoscopy and Slit-Lamp Biomicroscopy:** These are essential for evaluating the anterior segment (cornea, iris, lens) and posterior segment (retina, optic nerve).
- **Fluorescein test:** Used to detect corneal ulcers, although it can be challenging to apply under the spectacle of a snake.
- **Schirmer's test and Red Phenol Thread Test:** to assess the tear production
- **Tonometry:** Measures intraocular pressure and can be performed with specialized instruments, but reference ranges for many species are limited.
- **Radiography, Ultrasonography and Computed Tomography (CT):** Useful for evaluating orbital trauma, fractures of the scleral ossicles, or retrobulbar masses like aspergillosis granulomas.
- **Advanced diagnostics:** Electroretinography to assess the innervation functionality, Ocular Coherence Tomography (OCT) to examine the structure of the retina/fovea.

Ocular Pathology

Generally, the ocular pathology can be classified as congenital, traumatic, infectious (primary or secondary) and geriatric.

Common Avian Ocular Diseases

- **Ocular trauma:** A leading cause of ocular pathology in birds, often resulting from cage accidents, conspecific aggression, or environmental hazards.
- **Conjunctivitis:** A common issue, often secondary to infectious agents such as *Mycoplasma* or *Chlamydophila* species, or due to a primary viral infection like **Avian Pox**.
- **Cataracts:** Frequently observed in aged parrots and can be inherited or associated with trauma or nutritional deficiencies.
- **Aspergillosis:** While a systemic disease, *Aspergillus fumigatus* can cause severe orbital and retrobulbar infections, leading to exophthalmos and blindness.

Common Reptilian Ocular Diseases

- **Retained Spectacle:** Incomplete shedding of the spectacle in snakes, often due to improper humidity, dehydration, or systemic disease. This can be a chronic issue, leading to corneal irritation and infection.
- **Hypovitaminosis A:** A critical nutritional disease, especially in chelonians, where it leads to **squamous metaplasia** of the Harderian and lacrimal glands. This causes the glands to swell and blocks tear ducts, resulting in severe conjunctivitis and periocular swelling.
- **Ophthalmic Infections:** Infectious conjunctivitis and blepharitis are common and can be caused by bacteria (e.g., *Mycoplasma*) or fungi, often as a result of poor husbandry.
- **Corneal Ulcers:** Common in reptiles with movable eyelids and can be caused by trauma, foreign bodies, or infectious agents.

Principles of ocular surgery

Many of ocular conditions require complex surgical intervention as treatment. It is best to consult a veterinary ophthalmologist on the most updated surgical techniques and equipment. Ocular surgery requires potent surgical microscope, microsurgical equipment, special equipment for anesthesia and intracameral application and microsurgical skills and competency.

Common Indications for surgical intervention

- Tarsorhaphy
- Nictican membrane tear
- Corneal ulcer
- Traumatic corneal perforation
- Pthisis bulbus/ enucleation/evisceration
- Cataract surgery and lens replacement

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