The Pathology of the Lens

Dick Dubielzig
Lens Development

- The induction of the lens placode
- Involution of the lens placode
- Elongation of the posterior lens epithelial cells
- Formation of the cortex
- The tunica vascularis lentis
Early Development
Lens Development
Normal Lens Anatomy

• Lens Capsule
  – Basement membrane of lens epithelium
  – Elastic properties
• Lens Epithelial Cells
  – Proliferation zone
• Nuclear Bow
  – Elongation and turning of LEC
• Lens Fibers
• Lens Sutures
• Anatomic Variations
  – Annular pad
  – The spherical lens
Normal Lens Morphology
Normal Lens Morphology
Abnormal Lens Shape
Lenticonus
Abnormal Lens Shape

Microphakia

Congenital lens coloboma
Cataract Definition

Any reduction in the optical clarity of the lens with or without reduction of vision.
Cataract Causes

- Advanced age
- Hereditary
- Trauma
- Diet
- Diabetes & other metabolic disorders
- Vitreous disorders
- Retinal disorders
- Inflammation
- Toxic
Cataract Morphologic Types

- Congenital cataract
- Intumescent cataract
- Early cortical cataract
- Mature cortical cataract
- Hypermature cortical cataract
- Morgagnian cataract
- Anterior subcapsular cataract
- Posterior subcapsular cataract
- Nuclear cataract
  - Nuclear cataract is a protein degeneration with no morphological features
Congenital cataract
Intumescent Cataract
Early Cortical Cataract
Mature Cortical Cataract
Hypermature cortical cataract
Morgagnian cataract
Anterior subcapsular cataract
The causes of cataract

• Previously clear lens fibers become opaque
  – Osmotic changes
  – Contusion or trauma disrupting lens fibers
• Formation of new opaque lens fibers
  – Congenital cataract
  – Toxic or radiation cataract where LEC is damaged
• Fibrous metaplasia (subcapsular cataract)
• Mineralization
Consequences of trauma on the lens

- Cataract
- Lens luxation
- Lens epithelial proliferation
- Feline Post-traumatic sarcoma
Lens epithelial cell metaplasia, proliferation, and migration following trauma
Complications after cataract surgery due to lens epithelial cells proliferation and fiber re-growth.

Soemmerring's Ring (Rabbit)
Lens Luxation

- Zonular ligament
  - Fibrillin is the glycoprotein subunit that makes up the backbone of the zonule fiber (not collagen)
- Trauma
- Buphthalmos
- Uveitis
- Marfans like syndromes
- Primary lens luxation in dogs
  - Jack Russell Terriers & similar terrier breeds, Chinese Crested, Shar-Pei, Australian Blue Heeler,
Hints to recognizing lens luxation in a pathological submission

- In the history (best way)
- Observation at the time of grossing the globe (2nd best way)
- Distorted angle of the iris leaflet
- Atrophy of the ciliary processes
- Position of the lens on the histoslide (very poor)
Primary lens luxation of Terrier dogs
Consequences of lens luxation

- Glaucoma
- Vitreous degeneration
- Corneal endothelial atrophy
- Retrocorneal membrane formation
Lens Induced Inflammation

The Phacitis Syndromes

- Lens Induced Uveitis (Phacolytic Uveitis)
  - Hypermature cataract
  - Results in synechia followed by possible glaucoma
- Septic implantation syndrome
  - Cat scratch
  - Bacteria embedded in the lens tissue
- Phacoclastic uveitis
  - Bland phacophagocytic inflammation
    - Lens capsule rupture or post operative exposure of lens protein
    - Purely a bland macrophage response
- Asymmetric Uveitis – Non-diabetic
  - Robust pyogranulomatous reaction
    - Carpeting of the uvea, retina, lens, or cornea
    - Small breed dogs with the Poodle being the most common
- Asymmetric Uveits – Diabetic variant
  - Robust pyogranulomatous reaction identical to above
  - Miniature Schnauzers are the most common breed
Septic Implantation Syndrome

- 20 cats and 46 dogs
- Disease duration average 6 weeks
- History of a traumatic event in 20% of cats and 39% of dogs
- 100% of traumatic events reported are a cat scratch
- Organisms identified in the lens in 70% of cats and 65% of dogs
Septic Implantation Syndrome
Septic Implantation Syndrome
Lens Induced Uveitis
Phacolytic
Bland Phacoclastic Uveitis
Asymmetric Uveitis

- Pyogranulomatous carpeting of the uvea, retina. Posterior cornea, or lens
- Typical Breeds (Small Breeds), Total = 168 cases
  - Poodle: 39
  - Mixed Breed: 20
  - Dachshund: 13
  - Schnauzer: 12
- Typically occurs first in one eye then the other
- Can be prevented or delayed with immune modulation
- A second form with exactly the same pathology occurs in diabetics but usually both globes at about the same time
- Breeds for Diabetic-variant, Total = 73 cases
  - Schnauzer: 22
  - Mixed Breed: 10
Asymmetric Uveitis
Asymmetric Uveitis