Ocular cytology: basic and advanced cases - 2nd part

Karen M. Young

VMD, PhD, Wisconsin, USA

CYTOLOGIC EVALUATION OF OCULAR STRUCTURES: NORMAL ELEMENTS AND RECOGNIZED DISORDERS

Part 1 contained information about collection of ocular samples, staining, categorization of lesions, and special cytologic features, including morphology of neutrophils and epithelial cells, inclusions, significance of bacteria, and extracellular material. In part 2, ocular structures are addressed. These 2 parts should be considered together: the principles of observation and interpretation described in part 1 apply to the disorders listed here.

Eyelids: Cytologic features of normal eyelids include cornified, intermediate, and/or basilar epithelial cells, depending on the depth of the sample; ciliated columnar epithelial cells from the palpebral conjunctiva; and meibomian (sebaceous) glands. Organisms, such as Corynebacterium spp and Staphylococcus spp, may be found in association with eyelids. Inflammation of the eyelid is termed blepharitis and may be neutrophilic, eosinophilic, or mixed cell blepharitis, and the etiology may be infectious, allergic, or immune-mediated. Organisms may be detected in infectious blepharitis. Mast cells and mononuclear cells also may be noted in allergic blepharitis. Neoplasms of the eyelid include sebaceous (meibomian gland) adenoma, melanoma, lymphoma, mast cell tumor, histiocytoma, papilloma, squamous cell carcinoma (especially in cats), basal cell tumor, and, infrequently, sarcomas. Non-neoplastic mass lesions found on the lid are chalazions (lipogranulomas of the meibomian gland), hordeola (abscesses of the meibomian gland), and cysts containing debris, macrophages with RBCs or iron pigment, and cholesterol crystals from degenerating epithelial cells.

Conjunctiva: Ciliated columnar cells and goblet cells are found in palpebral conjunctiva, whereas noncornified squamous epithelium, sometimes with melanin granules, comes from bulbar conjunctiva. Smooth round basophilic inclusions may be seen in the cytoplasm of epithelial cells from eyes treated with topical ointment. Samples taken near the fornix often yield some lymphocytes. Bacterial cocci may be noted in samples from dogs without evidence of inflammation.

For exudative lesions of the conjunctiva, make a smear of the exudate; then clear the exudate and sample the conjunctiva by scraping. Often the exudate contains mucus and cell debris, but sometimes etiologic agents, such as Blastomyces, are found. In neutrophilic inflammation, neutrophils may be nondegenerate or degenerate (degenerate neutrophils are uncommon in cats). Squamous cells may contain neutrophils (significance unknown). Bacteria may be seen cytologically, either within neutrophils or extracellularly. If the cause is Chlamydia spp organisms may be detected in epithelial cells (initial bodies are 3-5 µm; elementary bodies are 0.5-1 µm and are found in aggregates). The inflammatory infiltrate also may contain mononuclear cells, plasma cells, and multinucleate giant cells. IFA may be required for a definitive diagnosis. If the cause is Mycoplasma spp, organisms may be found on epithelial cells as these organisms are epicyellar. Culture may be required for definitive diagnosis. Viral etiologies include distemper in dogs and herpesvirus in cats. Viral inclusions rarely are seen cytologically, and IFA staining and/or PCR assays are required for a diagnosis. Eosinophilic inflammation typically is caused by hypersensitivity or allergic causes, and mast cells and free eosinophil and mast cell granules often are noted. Some cats with eosinophilic conjunctivitis are positive for herpesvirus. Eosinophilic conjunctivitis may be a single entity or be part of eosinophilic keratoconjunctivitis. Follicular conjunctivitis resembles reactive lymphoid hyperplasia and also may be seen in allergic and chronic infectious conjunctivitis. Neoplasms of the conjunctiva include papilloma, squamous cell carcinoma, melanoma, lipoma, mast cell tumor (which can form a mass or be diffuse in the conjunctiva of dogs), lymphoma, hemangioma and hemangiosarcoma, and other sarcomas. Non-neoplastic mass lesions include cystic lesions (dacryops, zygomatic mucocoele, inclusion cyst), deposits of granuloma, and staphyloma.

Nictitating membrane: The nictitating membrane consists of cartilage, conjunctiva, seromucous glands, and lymphoid tissue on the bulbar surface. This membrane may be involved in any inflammatory disease affecting the conjunctiva. Follicular hyperplasia can be found here, and German Shepherds may develop plasmacytic conjunctivitis that extends to the nictitans. Both primary and metastatic tumors have been reported to occur and include lymphoma, squamous cell carcinoma, adenoma/adenocarcinoma of the 3rd eyelid gland, and melanoma.

Nasolacrimal apparatus: Inflammation is referred to as dacryocystitis. Cysts, including dacryops and parotid transposition mucocoele, have been reported.
Sclera/episclera: Nodular fasciitis/episcleritis (dome-shaped) usually is characterized by mononuclear inflammation, consisting of lymphocytes, plasma cells, and macrophages, as well as a few neutrophils. Lymphoma, mast cell tumor, squamous cell carcinoma, and melanoma have been reported in this location.

Cornea: Cornea is formed of collagenous stroma covered by noncornified squamous epithelium. Ulcerative keratitis can be caused by bacteria or fungi (rare in cats). Fungal hyphae sometimes are embedded in clumps of epithelial cells, and special stains (PAS, Gomori’s methenamine silver) may be helpful. Eosinophilic keratitis appears as granular, nonulcerated, gray-white deposits on the cornea. Cytologically, eosinophils, including free granules, mast cells, and sometimes lymphocytes and plasma cells are noted. Panuus (chronic superficial keratitis with mixed inflammation) is a proliferative inflammatory lesion. Corneal neoplasms are rare in dogs and cats. Squamous cell carcinoma is the most common tumor and may be diffuse rather than forming a mass lesion. It may be accompanied by neutrophilic inflammation and must be distinguished from primary inflammatory lesions with secondary dysplastic changes. Other tumors include melanoma, papilloma (virally induced in young dogs), sarcomas (hemangiosarcoma, fibrosarcoma), and histiocytoma. In dogs, stromal epithelial inclusion cysts (unique to dogs, caused by trauma?) contain clear acellular fluid.

Aqueous humor: Aqueous humor is normally acellular. Neutrophilic inflammation accompanies most causes of anterior uveitis. Organisms may be seen and include bacteria, Blastomyces, Prototheca, and Leishmania.

Neoplasms of the anterior uvea include lymphoma and, less frequently, carcinomas, sarcomas, transmissible venereal tumor, and feline myeloproliferative diseases. With hypHEMA, erythrocytes and hemosiderophages are noted.

Iris/ciliary body: It is normal to see melanin granules in samples of iris or ciliary body. Neoplasms include melanoma, lymphoma (mass lesion or diffuse), adenoma, adenocarcinoma, and metastatic carcinomas. Feline progressive iris hyperpigmentation with features of anisokaryosis and nucleolar variation may be a diffuse iris melanoma.

Vitreous body: Vitreous fluid may be examined cytologically if opacity is noted. Normal fluid is acellular or contains a few RBCs and a small number of spiculate melanin granules from retinal pigmented epithelial (RPE) cells. The background is granular. Endophthalmitis is usually neutrophilic and the etiology may be traumatic, bacterial, fungal (Blastomyces, Cryptococcus, Histoplasma), or algal (Prototheca). Hemorrhage can result from bleeding disorders, retinal detachment, intraocular tumor, hypertension, orrickets.

Orbital masses: Orbital masses are typically evaluated by retrobulbar fine-needle aspiration. Inflammatory conditions include abscess, foreign body, osteomyelitis, extension of sinusitis, oropharyngitis, and fungal infections. Neoplasms include squamous cell carcinoma, lymphoma, plasmacytoma, salivary gland carcinoma, melanoma, osteoma, hemangioma, fibrosarcoma, chondrosarcoma, and meningioma. Also, neoplasms in the sinus or oral cavity may extend into the orbit. Non-neoplastic lesions include hematoma, mucocele, and cysts, some of which develop post-enucleation.

ADDITIONAL READING

Author’s Address Correspondence: Karen M. Young, Clinical Professor and Section Head of Pathology, Department of Pathobiological Sciences School of Veterinary Medicine University of Wisconsin-Madison, Madison, WI, USA