In collaboration with the American College of Veterinary Pathologists

Pathology in Practice

History

An adult 7.9-g male American anole lizard (*Anolis carolinensis*) with a history of progressive weight loss and the presence of bilaterally large, slowly enlarging dorsal cervical masses was euthanized and presented for necropsy.

Clinical and Gross Findings

The cervical swellings had a soft tissue opacity with radiopaque centers on post-mortem radiography. The lizard was in moderate body condition with bilateral inguinal fat pads. A bilateral, large (approx 1 X 1.4-cm), fluctuant, firm, subcutaneous, round swelling was present dorsal to the proximal cervical vertebrae (Figure 1). Upon cut section, the left lobe of the mass contained white viscous material and the right contained clear, yellow-tinged fluid with a firm, bright white central area. No other clinically meaningful gross findings were detected. Representative sections of the cervical mass and additional organs were collected and fixed in neutral-buffered 10% formalin, sectioned at 5-µm slice thickness, and stained with H&E stain.

Formulate differential diagnoses, then continue reading.

Histopathologic Findings

Histologic examination of the mass revealed a partially intracranial epithelial-lined cyst that abutted the leptomeninges of the brain and extended into the cervical musculature of the atlanto-occipital region (Figure 2). The cyst was located dorsocaudal to the calvarium, and the cyst lining was congruent with the inner ear with the same singular lining epithelium and visible sections of macule and spiral ganglion located ventral to the cyst. The cyst lumen contained homogenous to vacuolated pale eosinophilic material that stained positive with periodic acid-Schiff (PAS) staining and was interpreted as proteinaceous fluid, frequent deposits of basophilic granular material (mineral), rare corpora amylacea, and scattered aggregates of necrotic debris and rare macrophages (Figure 3). The cyst was lined by a single thin layer...
of low cuboidal cells that were often attenuated and occasionally formed delicate papillary projections into the cyst lumen. The lining epithelial cells had occasional positive intracytoplasmic granular staining with PAS stain. At the apical surface of these cells, there were occasional small clear vacuoles within the proteinaceous fluid. Multifocal deposits of mineral throughout the lesion stained positive with von Kossa staining and occasionally were associated with fibrous connective tissue and infiltrated by small numbers of macrophages, heterophils, lymphocytes, and plasma cells. The infiltrates extended into the surrounding perimysium. Focally, the cyst was separated from the brain by only the lining epithelium and the leptomeninges; no clinically meaningful abnormalities were noted in the brain. Radiating deposits of acicular material surrounded by macrophages and multinucleated giant cells were scattered multifocally throughout the kidney (consistent with urate tophi). Deposits of granular purple material (mineral confirmed with von Kossa staining) were present within the glomerular tufts and within the lumina of the renal tubules. The renal tubules and collecting ducts rarely contained flocculent urate deposits or deeply eosinophilic amorphous material (protein) within their lumina. Diffuse hepatocellular atrophy was present throughout the liver. Hepatocytes were frequently shrunken and contained small amounts of pale cytoplasm with large, well-defined clear vacuoles (fat). An acid-fast stain was applied to an impression smear of the yellow-tinged fluid from the right lobe of the cervical mass, and a swab of the fluid was submitted for routine bacteriologic culture. Both the acid-fast stain and routine culture failed to reveal the presence of any bacterial or fungal organisms.

Morphologic Diagnosis and Case Summary

Morphologic diagnoses: bilaterally symmetric, endolymphatic sac dilation and mineralization and mild, chronic lymphohistiocytic sacculitis; moderate, multifocal, chronic renal urate deposits (gout) and mineralization; and diffuse, moderate, chronic hepatocellular atrophy.

Case summary: inspissated, cystic endolymphatic sacs in an anole lizard.

Comments

Although believed clinically and upon gross examination to be an abscess or granuloma, upon histological examination, the bilobed cervical mass was determined to be of cystic origin. A cyst is defined as a cavity lined by epithelium and filled with liquid or semisolid material. This structure was compatible with the endolymphatic sac based upon the anatomic location and bilobed appearance. The material within the cyst was inspissated and largely mineralized with multifocal disruption of the cyst wall associated with mild inflammation of the surrounding tissues. The endolymphatic sac is intracranial in most species; however, in some geckos and anoline iguanids, it has been reported to extend extracranially into the cervical musculature, as seen in this case. In reptiles, endolymphatic sacs are thought to play a role in calcium metabolism, perhaps acting as a site of storage of calcium carbonate that can be mobilized during egg formation and can be referred to as the chalk gland or sac. The endolymphatic duct is found in all species as part of the membranous labyrinth of the inner ear and forms embryologically from an outpouching of the otic vesicle (neuroectoderm). Endolymph (a mixture of fluid and crystals) moves within

Figure 2—Photomicrograph of a longitudinal section through the cervical mass of the anole in Figure 1. Note the cystic structure (black asterisks) caudal and dorsal to the brain (white asterisk) and extending along the nuchal region; bar = 1,000 μm. Inset—The cyst contains mostly eosinophilic proteinaceous fluid and is lined by a simple cuboidal epithelium with rare blunt projections into the lumen. H&E stain; bar = 20 μm.

Figure 3—Photomicrograph of a section of the cervical mass of the anole in Figure 1. The cystic structure contains deposits of amorphous, basophilic material (black asterisk; interpreted as mineral) and is narrowly separated from the brain (white asterisk) by a thin membrane consisting of meninges and the attenuated cyst lining. H&E stain; bar = 20 μm.
the membranous labyrinth, composed of the endolymphatic duct, sacculus, cochlear duct, and semicircular canals, and stimulates the lining sensory cells responsible for interpretation of sound. The underlying pathogenesis resulting in dilation of the endolymphatic sacs in this case was unknown. As the anatomic structures are thought to be involved with calcium metabolism associated with egg laying, it was interesting that the affected animal in this case was an adult male. Renal gout was detected in this case and may have been attributed to dehydration resulting from decreased food and water intake. One could speculate that renal disease could have resulted in serum calcium abnormalities in this case, thus stimulating the endolymphatic sacs.

Disease of the endolymphatic sacs is poorly described in the veterinary literature, but nuchal mycotic granulomas and hematomas associated with Trichosporon cutaneum, thought to have been due to a bite wound in the cervical region, have been reported in the American anole and appear to be located in the same anatomic region. Neoplastic lesions thought to originate in endolymphatic sacs have also been described in reptiles, dogs, and humans. In humans, pseudotumors of endolymphatic origin have been described with a benign histological appearance that can be associated with syndromes such as Menière disease and von Hippel-Lindau disease with hearing loss, tinnitus (inflammation of the tympanic membrane), facial nerve paralysis, and vertigo. True neoplasms of endolymphatic origin have been described to have tubular to papillary formation and local invasion and appearances similar to adenocarcinomas. Dilatation and inspissation of normal anatomic structures should be included as differential diagnoses for clinicians that encounter any species with nodular swellings, with endolymphatic sacs being of particular importance in reptiles. These lesions could easily be misdiagnosed as abscesses and treated inappropriately with antimicrobials. Comparative anatomy and understanding of unique adaptations of species are essential for the exotic animal clinician and pathologist.

References