

CHONDROBLASTIC OSTEOSARCOMA IN TWO RELATED SPINY-TAILED MONITOR LIZARDS (*VARANUS ACANTHURUS*)

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Abstract

Two male spiny-tailed monitor lizard (*Varanus acanthurus*) broodmates were diagnosed with chondroblastic osteosarcomas associated with the pelvic girdle. One lizard was 6 months old and the other 5 months old at the time of diagnosis. Grossly, the tumors appeared as large, firm, multilobulated masses that were white on cut surface and firmly adhered to the underlying bone. Histologically, both tumors were characterized by proliferation of neoplastic spindloid to stellate cells that encompassed the vertebrae and invaded into the vertebral and pelvic bones. Both osteoid production and multifocal chondrous differentiation were observed within neoplastic masses. Retinoblastoma 1 was absent in neoplastic cells. Even though osseous neoplasms are rare amongst reptiles, *Varanus* spp. may have a genetic predilection for developing chondroblastic osteosarcoma. Copyright 2013 Elsevier Inc. All rights reserved.

Key words: chondroblastic; monitor lizard; osteosarcoma; reptile; *Varanus acanthurus*

V *aranus acanthurus*, the spiny-tailed monitor, is a carnivorous lizard native to the northwestern regions of Australia. Commonly reported clinical illnesses in *Varanus* species include chronic degenerative diseases as well as bacterial and viral infections, and in captive animals, diseases related to husbandry and management.^{1,2} Neoplastic diseases, including malignant mesenchymal neoplasms, are relatively uncommon in lizards, with a prevalence of 2% to 10% in necropsied animals.³ There are very few reports of boney neoplasms affecting lizard species, but include the following publications: an osteosarcoma (OSA) in a monitor lizard (*Varanus* spp.),⁴ an osteochondrosarcoma in a desert monitor lizard (*V. griseus*),⁵ and an osteochondrosarcoma in an Indian monitor lizard (*V. bengalensis*).⁶ Furthermore, Frye⁴ reported multiple osteocartilaginous exostoses affecting the limbs and ribs of a juvenile *V. bengalensis nebulosus*.

A review of data from all necropsied reptiles at the Philadelphia Zoo from 1901 to 2002 revealed neoplasia in 2.3% of cases (86 of 3684 animals necropsied).⁷ In this period, 22 neoplasms were identified in 19 lizards, with the liver being the most commonly affected organ (32%, 7/22).⁷ There were no reports of skeletal neoplasms in this review. A retrospective study of 85 necropsied members of the genus *Varanus* housed at the Bronx Zoo revealed neoplasia in 6 animals (7.1%): oral squamous cell carcinomas (2), hepatic neoplasm (1), ovarian neoplasm (1), leukemia (1), and scapular neoplasm (1).⁸ A review of neoplasms

from reptile species submitted to a specialty exotic animal pathology service showed that 8.5% (162/1909) of the lizard submissions were diagnosed with neoplasia.⁹ Monitors had the highest prevalence of neoplasia in submitted specimens (9.9%), followed by skinks (9.2%) and agamids (8.6%).⁹ Of the 20 monitors diagnosed with neoplasia, 5 cases were identified as squamous cell carcinomas and 4 as lymphoma, but no bone tumors were noted.⁹ A second retrospective study by the same diagnostic service examined submissions of 1297 lizards, with 81 cases (6.2%) being diagnosed with neoplastic

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FIGURE 1. *Animal 1:* A large, firm, bilobed, 3.5 cm × 3.0 cm × 1.0 cm mass attached to the dorsal pelvis with ulceration of the overlying skin.

disease that included hematopoietic neoplasms (17), hepatic neoplasms (8), and chondrosarcoma (1).¹⁰

Chondroblastic OSAs were initially identified as pelvic masses in 2 young (5 and 6 month old), male, spiny-tailed monitor lizards. The animals were members of the same brood and breeding colony. The lizards had similar disease progression and clinical signs, presenting with slow growing, firm masses in the pelvic area. A 3-mm punch biopsy sample of the mass collected from 1 patient (5 month old) and submitted for histopathologic evaluation was diagnosed as chondrosarcoma. At a follow-up examination 3 weeks later, the mass was markedly increased in size and extending into the proximal tail. The animal was lethargic, anorexic, dehydrated, had difficulty defecating, and urates



FIGURE 2. *Animal 1:* On cut section, the mass is white and homogeneous with marginalization and compression of local vital structures.

were present on the ventrum. Euthanasia was elected and a full necropsy was performed. The second spiny-tailed monitor lizard (6-month-old male) had a similar progression of disease and was euthanized 1 month after the first lizard and was submitted for necropsy.

At necropsy, both lizards were moderately underweight. The 5-month-old male lizard had a large, firm mass encompassing the dorsal portion of the pelvis, measuring 3.5 cm × 3.0 cm × 1.0 cm, and covered with normal epidermis (Fig. 1). The subcutaneous tissue caudal to the mass was moderately swollen, causing mild compression of the vent. On the cut surface, the mass was firm, white, homogeneous, and had completely engulfed portions of the underlying pelvic bone. Other gross necropsy findings included mildly swollen kidneys and a markedly firm liver with a gritty texture and multifocal pinpoint hard foci throughout the parenchyma and over the serosal surface, consistent with visceral gout. The 6-month-old male lizard had a caudal abdominal mass that extended from the tail base to the midabdomen and involved the lumbar spine and pelvic bones. The large, bilobed, firm white-to-tan mass measured 4.5 cm × 3.5 cm × 1.5 cm. On cut surface, the mass was white and solid and surrounded the lumbar spinal cord with circumferential vertebral invasion (Fig. 2). The mass enveloped the distal aspect of the colon, causing compression and cranial distention, and also involved both ureters. Other gross findings included 3 to 4 mL of serosanguineous coelomic effusion, a markedly firm liver with a gritty surface texture, and multifocal pinpoint hard foci throughout the hepatic parenchyma and on the serosal surfaces of the liver, colon, and dorsal aspect of the peritoneum, consistent with visceral gout.

Tissues were fixed in 10% neutral buffered formalin, paraffin embedded, sectioned at 5 μm thickness, and stained routinely with hematoxylin and eosin. The pelvic masses appeared microscopically similar in both animals. Neoplastic cells encompassed the vertebrae and invaded into the vertebral and pelvic bones (Fig. 3). In the 6-month-old lizard, the neoplasm also disrupted the ventral aspect of the vertebral canal and encircled the abdominal viscera (colon, testes, and ureters). The neoplastic cells sometimes caused focal fragmentation of normal bone trabeculae and lytic necrosis (Fig. 4). Most neoplastic cells were spindloid to stellate with fine fibrillar eosinophilic cytoplasm and oval to round hyperchromatic nuclei (Fig. 5). Mitoses were rare

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