

Splenic Hemangiosarcoma in a Corn Snake, *Elaphe guttata*

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ABSTRACT: An adult corn snake with a prominent mid-body swelling and history of anorexia presented for evaluation. Contrast radiographs were performed which showed a soft tissue opacity, likely an extraluminal mass, that compressed the gastrointestinal tract both ventrally and to the left. Surgical exploration showed a highly vascular, encapsulated, red mass and the mass was removed. Histopathology on the mass showed it to be a splenic hemangiosarcoma. Despite mass removal and aggressive supportive care, the snake died one and a half months later. This is the first report of splenic hemangiosarcoma in any reptile species and expands the list of known differential diagnoses for mid-body swellings in a snake.

KEY WORDS: corn snake, *Elaphe guttata*, hemangiosarcoma, spleen, neoplasia, mass, tumor.

CASE REPORT

A captive adult male corn snake, *Elaphe guttata*, presented for evaluation of a prominent mid-body swelling ~55% of body length from the head. The snake was originally wild-caught and was determined to be male based on hemipenal probing. Since its capture, the snake was held in a fiberglass cage (91.4 x 40.6 x 50.8 cm) on newspaper substrate. The

temperature and humidity were maintained at 78°F (25.6°C) and 55 – 65%, respectively, and a fluorescent light was provided. The snake was offered an adult mouse (Mice On Ice, Zoological Pet Food, Gainesville, FL) every two weeks and provided ad lib access to water purified by reverse osmosis in a dish in the enclosure. The enclosure was monitored daily and cleaned as needed (Wipe Out Terrarium Disinfectant, Zoo Med Laboratories, Inc, San Luis Obispo, CA). The snake was

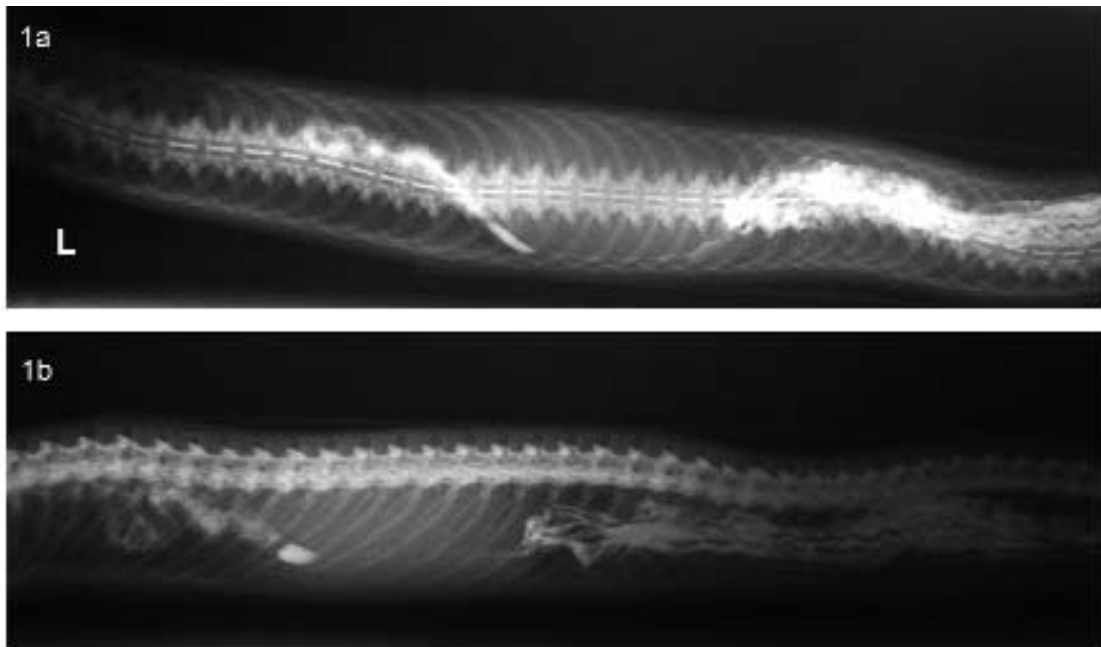


Figure 1a and 1b. Barium contrast study fifteen minutes following barium administration in an adult male corn snake, *Elaphe guttata*, shows attenuation of contrast material in the area of a soft tissue opacity with dorsoventral (a.) and left lateral (b.) views. The extraluminal splenic mass is causing compression of the gastrointestinal tract in that area both ventrally and to the left. Linear filling defects in the intestines are also noted.

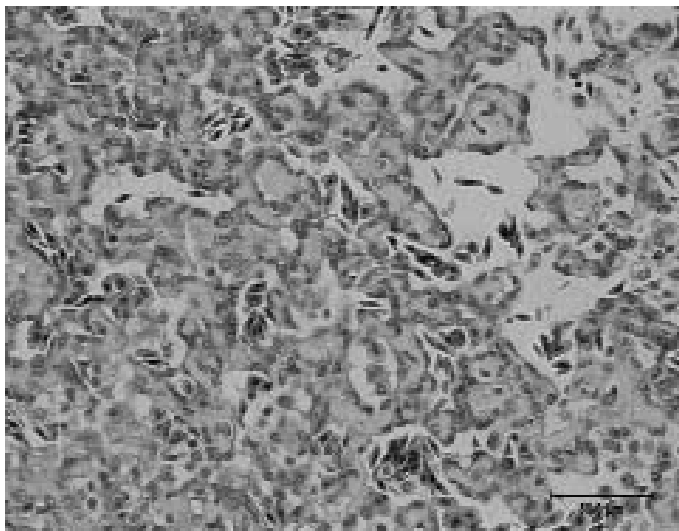


Figure 2a. Splenic hemangiosarcoma in a corn snake, *Elaphe guttata*. Polygonal to spindle-shaped neoplastic cells form variably sized, irregularly shaped blood vessels that efface the splenic parenchyma. Haematoxylin and eosin. Magnification 400X.

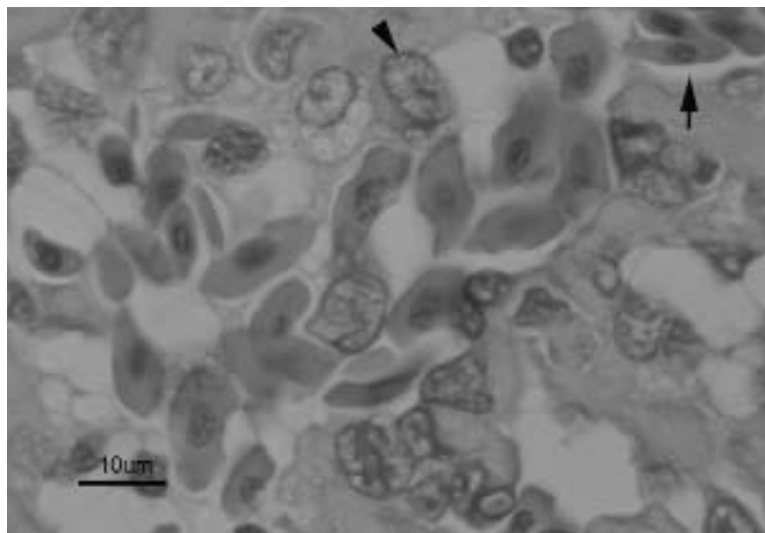


Figure 2b. Close up of splenic hemangiosarcoma. This photomicrograph depicts the irregular vascular channels formed and lined by irregularly shaped and variably sized spindle to polygonal neoplastic cells with indistinct cell borders, moderate amounts of cytoplasm, and large pleomorphic nuclei with clumped to margined chromatin and visible nucleoli. Arrow: Erythrocyte. Arrow head: Neoplastic endothelial cell. Magnification 1000X.

handled for use in educational programs twice weekly for 15-30 minutes duration. The snake had no history of medical problems during its four years in captivity until the swelling was noted.

At examination, the snake was noted to be in thin body condition (330 g) and had been anorexic for 2 months. The snake was slightly lethargic, and the swelling was firm. No reaction to mass palpation was noted. The snake's circumference in the area of the swelling was 5.1 cm, nearly double the normal circumference of the snake in that area (2.8 cm). Survey radiographs showed a soft-tissue opacity in the area of the

swelling. The snake was administered 18 ml/kg of barium sulfate contrast media (Readi-Cat Barium sulfate suspension, 60%, EZ-EM, Inc., Lake Success, NY) via orogastric intubation and the barium passage near the area of the mass was monitored radiographically fifteen minutes post-barium administration. Contrast radiographs showed attenuation of the contrast media in the area of the mass and it was pushed ventrally and to the left (Figure 1a, Figure 1b). Linear filling defects in the intestines were also noted. Differential diagnoses for the attenuation of contrast media included an intraluminal tumor or granuloma, an intraluminal foreign body, a gastrointestinal mucosal or submucosal tumor or granuloma, gastrointestinal submucosal or mucosal hypertrophy, or an extraluminal tumor or granuloma. Comparing the affected area on the snake with published topographic anatomy of snakes in the family Colubridae (McCracken, 1991), it was thought the mass was affecting the stomach, spleen, caudal liver, or gall bladder.

A decision was made to surgically explore the swelling without undergoing further diagnostics since it was suspected that a mass would ultimately have to be removed. The snake was placed in an anesthetic chamber containing 8% sevoflurane gas (SevoFlo, Abbott Laboratories, Abbott Park, IL) in 100% oxygen until it became unresponsive. Once unresponsive, the animal was intubated with a size 2-mm uncuffed endotracheal tube and maintained on 2 – 5% (average 3%) sevoflurane gas for the duration of the procedure. Manual steady positive pressure ventilation at 4 breaths per minute was provided. The snake was placed in right lateral recumbency. An 8-cm incision was made on the left ventral side, at the intersection between the ventral scutes and lateral scales, slightly caudal to 50% body length. A red, smooth, highly vascular, and encapsulated extraluminal mass was noted, presumably of the spleen, though its origin could not be definitively determined. Several small vessels in the capsule and mass were ligated with 4-0 polyglyconate suture (PDS, Ethicon, Ethicon, Inc., Irvine, CA) and the mass was removed. Hemostasis was maintained by electrocautery (Sabre 180 electrosurgical unit, model # 60-5800-001, Conmed Aspen Labs, Utica, NY 13502) and vessel ligation with 4-0 polyglyconate suture. The mass was firm, weighed 8.9 g (2.7% of the snake's body weight), and was dark red on cut surface. After checking to ensure the patency of the gallbladder/bile duct, the abdomen was flushed with sterile saline. The muscle layer was closed with 4-0 polyglyconate in a simple interrupted pattern. The skin was closed with 4-0 monofilament nylon (Monosof, Syneture, Tyco Health Care, Norwalk, CT) in an everting horizontal mattress pattern. One mg/kg butorphanol (Torbugesic, 10 mg/ml, Fort Dodge Laboratories, Fort Dodge, Iowa) SC q 24 hr was administered for post-operative pain management for three days.

Cytology of the mass showed mostly blood with a mixed inflammatory cell population and immature round to spindle-shaped cells with pale eosinophilic cytoplasm and round nuclei with finely stippled chromatin and one to two occasionally visible nucleoli. Histopathology on the mass revealed splenic tissue almost entirely effaced by an unencapsulated neoplasm composed of polygonal to spindle cells arranged in short, haphazard streams and bundles that formed and lined variably sized, irregularly shaped, often anastomosing, blood-filled spaces. In some areas, the stroma between the vascular channels was amorphous, eosinophilic, and acellular. The neoplastic cells had indistinct borders, moderate amounts of

eosinophilic cytoplasm, irregularly round to oval to elongated nuclei with finely stippled to margined chromatin, and one variably distinct nucleolus. Mitoses were infrequent with 1 per 10 high powered fields and there was moderate anisocytosis and anisokaryosis. Numerous granulocytes and fewer mononuclear cells were noted scattered throughout the neoplastic mass. Given the formation of vascular channels, the cellular pleomorphism, and the presence of solid areas, the neoplastic mass was diagnosed a splenic hemangiosarcoma (Figures 2a and 2b). Factor VIII immunohistochemistry was attempted but the neoplastic cells did not stain. Although factor VIII immunopositivity would have supported the diagnosis of hemangiosarcoma, the lack of staining is not surprising as hemangiosarcomas in veterinary patients often do not stain with this antibody (Goldschmidt & Hendrick, 2002).

Following surgery, the snake continued to be anorexic. The calculated energy requirement for this snake, based on the recommended 2.5 X the standard metabolic rate estimated for stressed reptiles (Donoghue, 2006) was 36 kcal/day. While the animal was prescribed tube feedings of 14 mL of Eukanuba Maximum Calorie canned food (The Iams Company, Dayton, OH) daily until eating to meet these energy needs and prevent further weight loss, feedings in amounts greater than 12 mL or handling more frequently than every other day, caused the snake to regurgitate. Thus, the snake was tube fed 12 mL of the Eukanuba Maximum Calorie diet every other day. Regular administration of fluids was also prescribed to maintain hydration. The snake continued to lose weight at a rate of ~6 grams per week and regularly passed undigested food in the feces. The snake became emaciated. Forty-four days following surgery the snake was found dead. It had been seen alive, but especially lethargic, 20 hr prior to its death being noted.

A complete necropsy was performed. The snake was emaciated and weighed 280 g. The snake's eyes were sunken and cloudy. The specimen was moderately autolyzed but internal examination revealed a dark black-green liver, hugely distended gall bladder, and undigested food in the intestine just caudal to the stomach. The spleen, presumably having been completely removed during surgery, was not found. No other gross abnormalities were detected. Histopathology showed no remarkable microscopic lesions in any tissue examined, including, brain, eye, skin, muscle, rib bone, heart, lung, kidney, gonad, esophagus, stomach, intestine, liver, and gall bladder. No overt evidence of tumor metastasis or infectious disease was noted, though degree of autolysis may have obscured subtle neoplastic, infectious, or inflammatory lesions.

The reported mesenchymal tumors in snakes in the Colubridae family include chondrosarcoma (Mauldin and Done, 2006), osteosarcoma (Machotka, 1984), rhabdomyosarcoma of the heart and maxilla (Ball, 1946, Catão-Dias and Nichols, 1999), fibrosarcoma of skin, muscle, and body wall with and without metastasis to viscera (Hruban and others, 1989; Jacobson, 1984, Ramsay and others, 1992), leiomyosarcoma of the intestine (Barten, *et al*, 1981, Catão-Dias and

Nichols, 1999), lymphosarcoma in multiple organs (Cowan, 1968, Jacobson, *et al*, 1980, Jacobson, *et al*, 1981, Machotka, 1984, Kollias, *et al*, 1989, Frye, 1991, Catão-Dias and Nichols, 1999), ocular sarcoma (Mauldin and Done, 2006), and hemangiosarcoma of skeletal muscle and lung (Catão-Dias and Nichols, 1999). While splenic hemangiosarcoma has been reported in many mammalian species including humans (Giovagnoni, *et al*, 2005), dogs (Brown, *et al*, 1985), cats (Swayne, *et al*, 1989, Spangler and Culbertson, 1992), horses (Pusterla, *et al*, 2005), potbellied pigs (Morrow, 2002), deer (Yoon, *et al*, 1999), and rats (Howell, 1963), to the authors' knowledge this is the first report of a primary splenic hemangiosarcoma in a snake, or any other reptile species, and it expands the list of differential diagnoses for mid-body swellings of unknown origin in snakes.

Hemangiosarcoma is a malignant mesenchymal neoplasm originating from the vascular endothelium that is typically locally invasive, highly metastatic, and not often diagnosed until abdominal pain and hemoperitoneum from splenic rupture are noted (Stutz, *et al*, 1973, Ng and Mills, 1985, Prymak, *et al*, 1988, Spangler and Culbertson, 1992, Neuhauser, *et al*, 2000). In this case, the slender body shape of the snake allowed for visual diagnosis of the mass, though no rupture had occurred. Treatment for splenic hemangiosarcomas in veterinary patients includes surgical excision of the mass followed by aggressive chemotherapy (Clifford and others, 2000). Despite treatment, survival in most species is generally limited to two to six months post-diagnosis (Sordillo, *et al*, 1981, Prymak, *et al*, 1988). The poor general condition of this snake prevented any attempt of chemotherapy, and mass excision alone allowed for less than two months survival. It is unclear whether the unthrifty and declining condition of this snake following splenectomy was related to the tumor. While no metastases or lesions suggestive of an infectious or inflammatory process were found on histopathologic review, the autolyzed condition of the tissues may have obscured subtle lesions. It is also unclear whether snakes, like mammals, can function without a spleen, though successful splenectomy without adverse effects has been reported in lizard patients (Kanakambika and Muthnukkaruppan, 1972, Hussein, *et al*, 1979).

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