Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #**275**; Month: **January**; Year: **2026**

Answer sheet

Title: Canine renal extraskeletal osteosarcoma

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History: An 11-year-old castrated male German Shepard dog was referred by his rDVM for a severely distended abdomen and a three-week history of not eating. In-hospital computed tomography (CT) imaging revealed a left peritoneal mass on the cranial pole of the left kidney, so the dog was taken to surgery for mass removal. The dog recovered without complications and was discharged. The left kidney and renal mass were submitted for histopathologic evaluation.

Advanced Imaging: A large, irregularly-shaped, soft tissue attenuating mass that measured 13.8cm x 13.9cm x20.4cm originated from the cranial aspect of the left kidney. Multifocally throughout the mass, there were variably sized, amorphous to wispy, mineral attenuating regions. The mass caused rightward deviation of the small intestines, portal vein, and cranial mesenteric artery with cranial displacement of the spleen.

Gross findings: A formalin-fixed renal mass and kidney was presented for histopathologic evaluation. A large, firm, multilobulated, encapsulated mass effaced and compressed the renal cortex and medulla and measured approximately 58cm circumferentially x 14cm in height. On cut surface, the renal calyces were severely dilated, and the mass was mottled tan to white with a gritty texture.

Advanced Imaging (Pre- and postcontrast abdominal CT images):

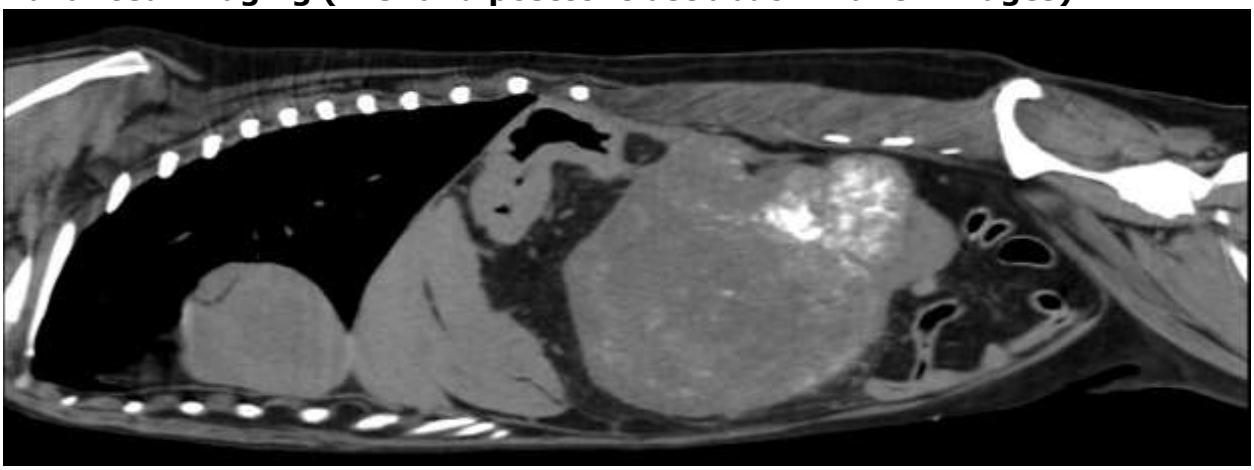

Figure 1. Pre-contrast sagittal image. There is a large heterogeneously soft tissue attenuating mass arising from the cranial pole of the left kidney. Note the multifocal mineral attenuating regions scattered throughout the mass.

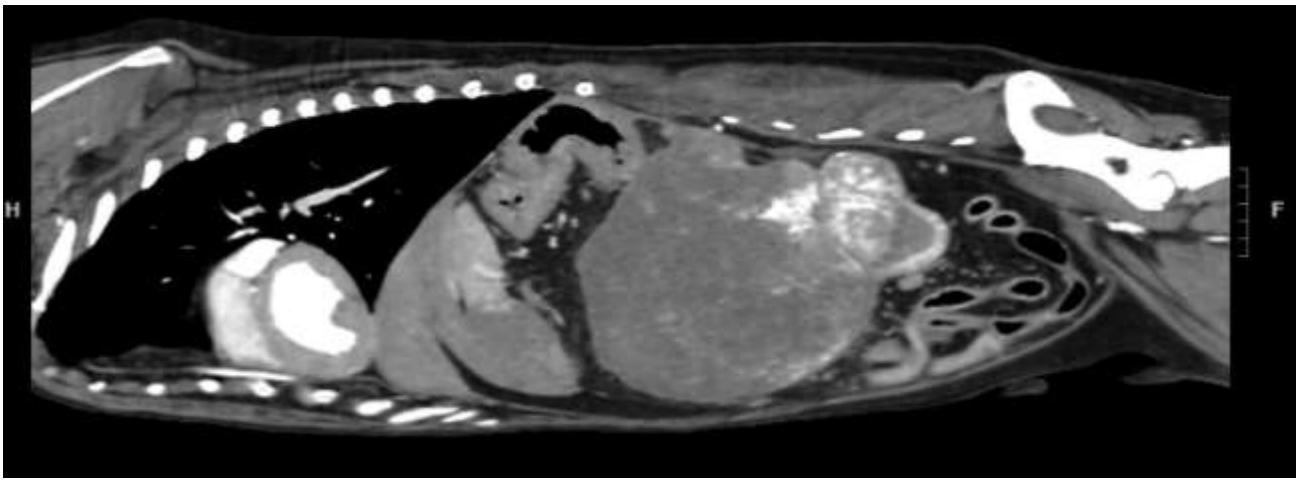

Figure 2. Post-contrast sagittal image. The large mass arising from the cranial pole of the left kidney displays heterogeneous and mild, primarily peripheral contrast enhancement.

Gross Findings:

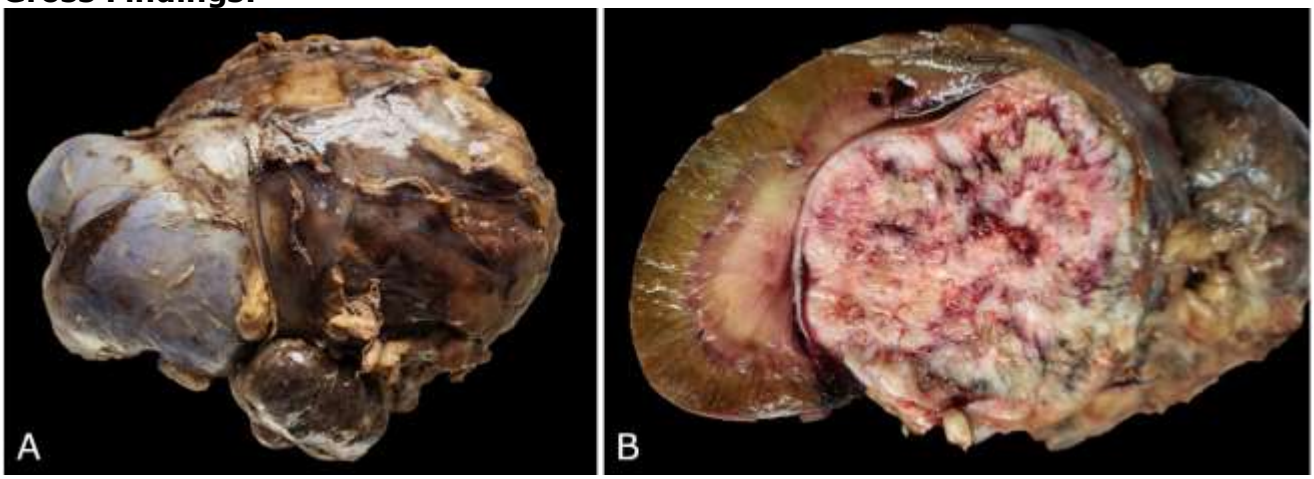

Figure 3. Left kidney, renal mass. **A:** Formalin-fixed tissue presented to biopsy. There is a large, firm, focal, well-demarcated, encapsulated, and multilobulated mass that expands the renal pelvis and compresses the medulla and cortex. **B:** Mass on cut surface. The mass is mottled white to tan to red to dark red with a gritty texture.

Histological description:

The renal pelvis is expanded by a large, well-defined, multilobulated, densely cellular, encapsulated mass that expands and compresses the renal medulla. The mass is composed of polygonal to spindle cells arranged in haphazardly arranged streams and poorly formed whorls supported by dense collagenous stroma (Figure 4A). Individual neoplastic cells have one round to ovoid nucleus, one nucleolus, and coarsely stippled chromatin. Widely disseminated throughout the mass are neoplastic cells that produce homogenous, eosinophilic osteoid matrix that forms mineralized, trabecular bone (Figure 4B). Neoplastic cells are often embedded within the osteoid matrix (Figure 4C). Mitotic figures are 29 mitoses in 2.37 mm^2 (10 FN22/40x fields). The cells display moderate anisocytosis and anisokaryosis. Scattered throughout the neoplastic population are large, multinucleated, foamy osteoclasts (Figure 4D) and areas of scattered hemorrhage with hemosiderophages. The capsule is thick and composed of collagen admixed with reactive fibroblasts and small caliber vessels. Vessels within the neoplastic capsule are often expanded by intraluminal clusters of neoplastic cells (vascular invasion). The center of the mass contains abundant neoplastic trabecular bone interspersed throughout necrotic cellular debris.

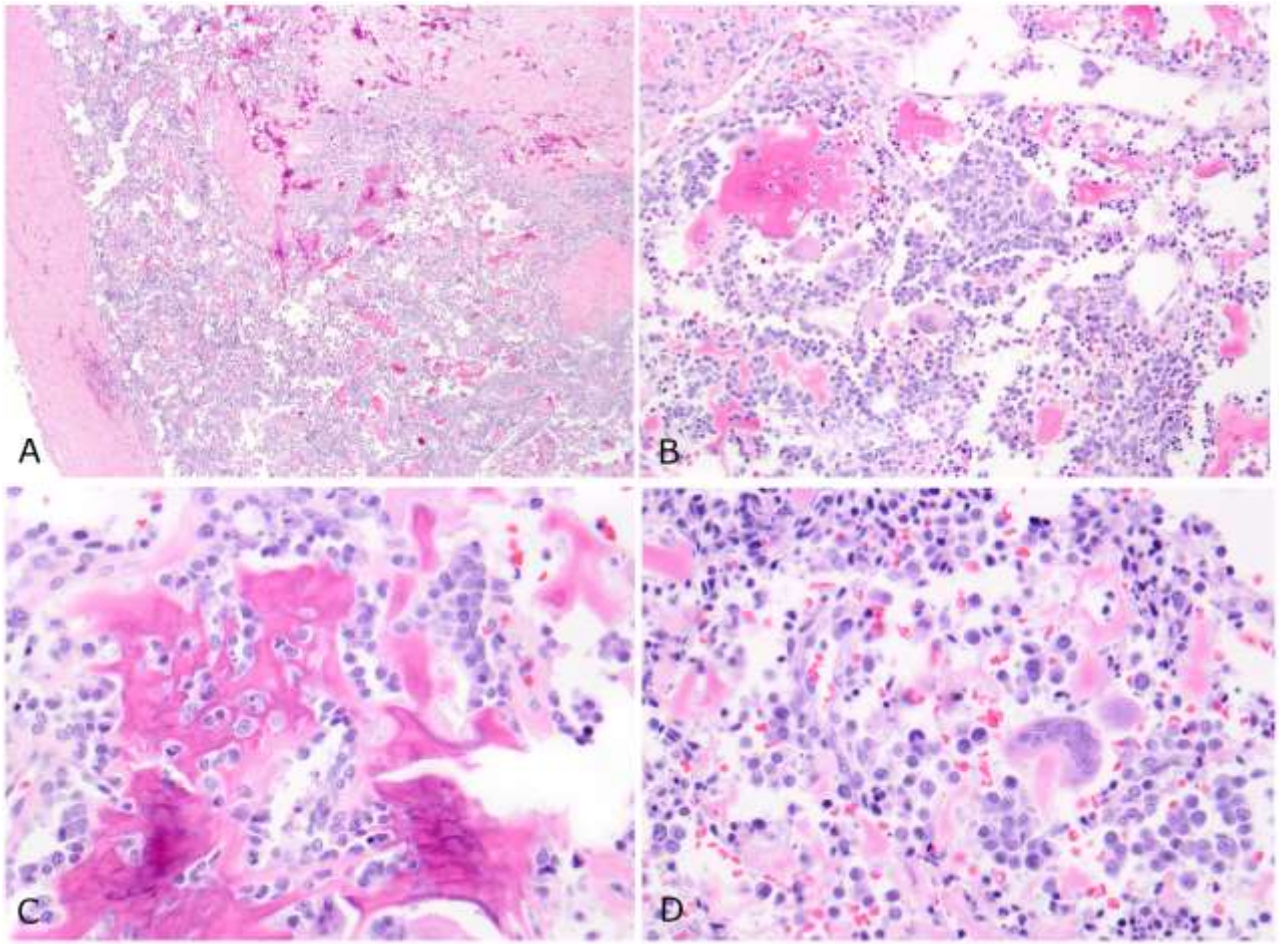

Figure 4. A: H&E, 2x**.** The left renal mass is encapsulated, and the center contains multiple clusters of immature trabecular bone. **B:** H&E, 20x**.** Neoplastic spindle cells with multifocal large, multinucleated osteoclasts. **C:** H&E, 40x. Neoplastic cells embedded within partially mineralized trabecular bone. **D**: H&E, 40x. An isolated osteoclast engulfing osteoid matrix surrounded by the neoplastic cell population.

Diagnosis: *Renal extraskeletal osteosarcoma*

Discussion:

Extraskeletal osteosarcomas are rare mesenchymal tumors that are poorly documented in both veterinary and human literature. Approximately 85% of canine bone tumors are classified as osteosarcomas, however only about 1% of osteosarcomas are characterized as extraskeletal (1,3,4). Extraskeletal osteosarcomas can arise from various tissues, with mammary tissue being the most common and well-documented and with the urinary tract being the most uncommon (1,4).

These tumors are grow rapidly giving a poor prognosis. In regards to extraskeletal osteosarcomas of renal origin, the most common presenting clinical signs include a distended abdomen and hematuria (4). One report of extraskeletal osteosarcomas in 169 dogs noted a median survival time of 26 days and fatality as the result of

local recurrence (3). One case study, albeit in a mammary extraskeletal osteosarcoma, reported that use of chemotherapeutics, namely cisplatin and doxorubicin, could extend the survival time, with the longest reported survival being 146 days (5). The rate and location of metastasis is variable, but tends to favor the lung and liver (5). In the current case, additional tissue had been submitted for histologic evaluation (liver, spleen, and gallbladder) with changes that suggested a chronic state of hypercoagulability or other blood disturbances, likely from metastasis.

Although not originating from bone, this mass was histologically consistent with an osteosarcoma, sharing classic features to axial osteosarcomas including neoplastic cells that produce and embed within hypereosinophilic osteoid matrix, irregular trabecular bone, and the presence of osteoclasts. The diagnosis is further supported by findings on advanced imaging. On computed tomography (CT), the mass was heterogeneously soft tissue attenuating with many random, wispy to amorphous mineral attenuating regions throughout it. These findings were very similar to a recent report of renal extraskeletal osteosarcoma in a dog (1). The mass also displayed mildly heterogeneous contrast enhancement within the soft tissue attenuating portions of the mass. Neoplasia was considered most likely, and although rare, extraskeletal osteosarcoma was prioritized given the described imaging characteristics. Additional CT findings included multiple soft tissue attenuating pulmonary nodules in addition to abdominal and sternal lymphadenopathy, suggesting probable metastasis.

This was a striking case of an extraskeletal osteosarcoma arising from the left kidney in a dog. A few weeks after discharge, the patient was reportedly doing well at home with no obvious issues, however, more recent updates on the patient's status have not been received. For this case, advanced imaging in combination with histopathology were key in obtaining a definitive diagnosis.

References:

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