Pathology in Practice

In collaboration with the American College of Veterinary Pathologists

History

A juvenile 2.95-kg female free-living brown brocket deer (*Mazama gouazoubira*) was found alone and prostrate in sternal recumbency in a natural savannah area in the Federal District, Brazil. The Screening Center of Wildlife Conservation, Brazilian Institute for the Environment (IBAMA) was notified and captured the deer.

Clinical and Gross Findings

The deer had a rectal temperature of 37.2 °C (reference range, 38.0 to 38.4 °C), reduced gut sounds, and a firm mass with irregular margins in the right ventral abdominal region. The remaining findings on physical examination were within reference limits. A CBC and biochemical analysis revealed high activities of alanine aminotransferase (58.0 U/L; reference range, 10 to 31 U/L), aspartate aminotransferase (1,362.0 U/L; reference range, 42 to 398 U/L), alkaline phosphatase (432.0 U/L; reference range, 41 to 414 U/L), and γ-glutamyltransferase (790.0 U/L; reference range, 32 to 190 U/L). Abdominal ultrasonography and CT revealed a large, heterogeneous, mixed-density mass with cystic areas and foci of mineralization occupying the right retroperitoneal region, displacing organs and extending from the caudal limit of the liver to the pelvis. Fine needle aspiration (FNA) biopsy of the mass was conducted, and cytologic examination revealed a mixture of pseudoglandular structures, squamous cells, cartilage islands, and myxomatous and spindle cell aggregates (not shown). Exploratory laparotomy revealed an inoperable tumorous mass in the region of the right kidney adhered to the retroperitoneal musculature and abdominal organs. Given the poor prognosis and the impossibility of tumor excision, euthanasia was performed.

Necropsy evidenced that the right kidney had been replaced by a 750.0 g multilobulated solid gray-brown mass (approx 16 X 14 X 10 cm) surrounded by a thick fibrous capsule and containing foci of mineralization and various sized cystic structures filled with brown mucoid contents (Figure 1). The mass represented 25.4% of the deer’s body weight and had replaced almost all of the right renal parenchyma, with scarce foci of normal renal cortex remaining. The mass was adhered to the left hepatic lobe, jejunum, and colon, and it cranially compressed the liver, diaphragm, and lungs. The deer is in left lateral recumbency with its right limbs and ribs reflected. B—Cut surfaces of the deer’s left kidney (L) and the large, multilobulated tumorous mass (arrow) with cystic areas of various sizes that have replaced most of the renal parenchyma of the right kidney (R).

Figure 1—Necropsy images of a juvenile 2.95-kg female free-living brown brocket deer (*Mazama gouazoubira*) that was found alone and prostrate in sternal recumbency in a natural savannah area in the Federal District, Brazil. A—There is a large tumorous mass (arrowheads) that is adhered to the abdominal musculature, left hepatic lobe, jejunum, and colon and that compresses the liver, diaphragm, and lungs. The deer is in left lateral recumbency with its right limbs and ribs reflected. B—Cut surfaces of the deer’s left kidney (L) and the large, multilobulated tumorous mass (arrow) with cystic areas of various sizes that have replaced most of the renal parenchyma of the right kidney (R).

Formulate differential diagnoses, then continue reading.

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Histopathologic Findings

During necropsy, organs and tissues were collected and fixed in neutral-buffered 10% formalin solution, routinely processed and paraffin embedded, and then 4-μm slice-thickness sections were stained with H&E, Masson’s trichrome, or Alcian blue stains. In addition, immunohistochemical assessments were performed with the use of primary antibodies directed against smooth muscle actin (1A4 SMA, Dako Corp), vimentin (V9 VIM, Invitrogen), anti-S100 protein (Polyclonal, Dako Corp), cytokeratin (AE1/AE3 CK, Dako Corp), and neuron-specific enolase (BBS/NC/VH-H14 NSE, Dako Corp). Tissue sections of skin and brain tissues from a brocket deer with no clinical signs of disease were used as positive controls. For negative controls, the primary antibodies in the tissue sections were omitted.

Histologically, most of the right kidney tissue had been replaced by densely cellular, unencapsulated, and expansive neoplastic proliferation within variable-sized cysts, predominantly of mature tissues that had originated in ectodermal, endodermal, and mesodermal layers, with fewer embryogenic elements of germ layer cells interspaced by loose mesenchyme. The ectodermal components were arranged in cystic or tubular structures lined by keratinized squamous epithelium or mucinous glandular epithelium (Figure 2). Tissues of endodermal origin were composed of pseudostratified cylindrical ciliated epithelium with goblet cells, resembling respiratory and simple ciliated columnar epithelia. Mesodermal elements comprised dispersed myxoid, osseous, and cartilage matrix islands and scattered adipose and smooth muscle tissues, as well-organized fibrous and loose connective tissues. The mass had multifocal areas of necrosis, mineralization, and inflammatory infiltrate of neutrophils along with remaining areas of renal parenchyma. Findings for sections of the mass stained with Alcian blue and Masson trichrome stains included mucinous cells and foci of cartilage and myxoid tissues (embryonic mesenchyme), respectively.

Immunohistochemical analysis identified smooth muscle structures and myoepithelial cells that stained positive for smooth muscle actin surrounding epithelial components, epithelial and glandular components with strong immunolabeling for cytokeratin, and loose and fibrous mesenchymal elements with immunostaining for vimentin (Figure 3). No tissues stained positive for neuron-specific enolase or S100 protein.

Morphologic Diagnosis and Case Summary

Morphologic diagnosis and case summary: mature cystic renal teratoma in a brown brocket deer (Mazama gouazoubira).

Comments

Teratomas are neoplasms of impressive morphological appearance and size that have long been identified in humans and domestic animals, and most teratomas are of gonadal origin. They are derived from totipotent germ cells that undergo somatic differentiation, contain at least 2 of the 3 germ layers (ectoderm, mesoderm, and endoderm), and classified as gonadal or extragonadal. Teratomas commonly arise in the gonads; extragonadal tumors are unusual and can be classified as mature or immature based on the proportions between tissue differentiation and immature embryonic elements. Anomalies during embryogenesis in mice have contributed to teratoma initiation due to the deregulation of the mitotic-miotic
switch in XY germ cells; however, these anomalies have yet to be demonstrated in other animals.

Renal teratomas are remarkably rare in domestic and exotic animals and have been reported in humans. To the best of our knowledge, only 1 case of renal teratoma in a llama was reported in veterinary literature. For the deer of the present report, we described clinical and pathological findings of an extremely rare instance of renal teratoma in a free-ranging South American cervid.

The deer’s clinical signs combined with its high serum activities of liver-related enzymes possibly reflected the compression of its gastrointestinal tract and liver by the neoplasm, as previously reported in a llama with teratoma in the right kidney. Despite the almost complete replacement of the right kidney by the tumor, the unilateral involvement was not sufficient to cause renal failure in the deer. Renal teratomas cause compression of the adjacent organs and are associated with constipation and abdominal pain in humans. To our knowledge, ultrasonographic and CT findings for renal teratomas in animals have not been reported; however, the heterogeneous cystic and mineralized aspects of the encapsulated mass in this deer, combined with the mass containing at least 2 germ layer-derived tissues were features similar to those reported in humans. Similar to the observation in this deer, a llama with renal teratoma had adhesions of abdominal organs that made resection of the tumor implausible and yielded a poor prognosis.

Histologic diagnosis of the renal teratoma in the deer of the present report relied on the characteristic components of the 3 germ cell layers, similar to those reported for an affected llama and other domestic animals with different organs and body locations affected. Intracrani[1] and testicular teratomas[2] have also been reported in South American cervids. For the deer of the present report, FNA biopsy proved useful in presumptively diagnosing the neoplasm, and the immunostaining profile observed confirmed the predominance of a mature, mixed epithelial-mesenchymal composition of the tumor mass, similar to that reported in other animal species[3,13,14] and humans. The embryogenic mechanisms involved in the development of renal teratomas remain unknown; however, the proximity between the nephrogenic cord and gonadal ridge combined with failures in cell migration may justify the displacement of germ cells within the kidney.

The diagnosis of renal teratoma in the deer of the present report was made by identifying the morphological characteristics of the tumoral mass as having originated in the right kidney parenchyma, with remnant foci of renal cortex (well-developed glomeruli and tubules); both ovaries had normal anatomic location and morphological aspects; and the teratoma was sharply separated from the retroperitoneal tissues despite some small foci of adherences within this region. Despite the unique morphological aspect of renal teratomas, key differential diagnoses of primary renal masses include benign and malignant epithelial, mesenchymal, and embryonal tumors. Nephroblastomas are one of the most common primary tumors of kidneys in some domestic animals and are composed of a mixture of embryonal tubules and glomeruli, mesenchymal tissues, and blastema. Teratoid nephroblastomas have a mixed-tissue composition of epithelial, mesodermal, or both components and are the main differential diagnosis of renal teratomas. The renal teratoma in the deer of the present report had remnant mature tubular and glomerular structures, which differentiated it from those immature components in nephroblastomas. Findings for the deer of the present report indicated that, despite their rarity, renal teratomas should be considered a differential diagnosis of renal tumor masses in domestic and wild animals.

References