URINARY BLADDER INCARCERATION AND INFARCTION BY AN INTRA-ABDOMINAL FAT PAD IN A VIRGINIA OPOSSUM (*DIDELPHIS VIRGINIANA*)

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A 2.5-year-old, female opossum had acute stranguria. Based on radiography and ultrasonographic examination a cystic structure was identified in the caudal abdomen associated with bilateral hydroureter and hydronephrosis. This structure contained a neutrophilic fluid, determined to be urine. There was a neutrophilic leukocytosis. Serum chemistry values were within normal limits. The opossum was euthanized. An intra-abdominal fat pad incarceration of the urinary bladder above the trigone was present, resulting in complete obstruction of the urinary bladder and partial obstruction of the ureters. Vessels to the bladder were involved in the incarceration which resulted in vascular compromise and infarction of the bladder. Mild to moderate hydroureter and hydronephrosis were present. *Veterinary Radiology & Ultrasound, Vol. 45, No. 4, 2004, pp 312–314.*

Key words: hydronephrosis, hydroureter, infarction, marsupial, opossum, ultrasound, urinary bladder.

Introduction

NONINFLAMMATORY DISORDERS OF the urinary bladder include urolithiasis, obstruction, infarction, neoplasia, rupture as a result of trauma or parturition, patent urachus, and urachal remnant.[1–3] Ultrasonographic examination and radiography provide methods of detection of these disorders. The purpose of this report is to present the radiographic, ultrasonographic, and pathologic findings of urinary bladder obstruction and infarction secondary to entrapment by a segment of pedunculated intra-abdominal fat pad in a Virginia opossum (*Didelphis virginiana*).

Case History

A 2.5-year-old, intact, female, Virginia opossum (*D. virginiana*) was examined at the North Carolina State University, College of Veterinary Medicine (CVM) for a 3-day history of inappetence and stranguria. The opossum was an educational program animal at the local museum of natural science, and was housed in a stainless steel cage with towels for bedding. Ad libitum water and a diet of mixed vegetables, cat food, fresh and canned fruit, and yogurt were provided daily. The opossum was handled for programs one to two times weekly.

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The opossum was quiet, alert, and responsive and was considered obese. Scant amounts of red-tinged perivulvar urine were present. The opossum frequently strained to urinate and would produce small amounts of grossly normal urine. On palpation, a large semi-firm mass was present in the ventral abdomen. Heart rate was 180 bpm, and the respiratory rate and effort were normal. There was mild poikilocytosis and polychromasia, and leukocytosis (23,100/μl) with neutrophils predominating (14,553/μl). Mild toxicity of neutrophils was present.

The opossum was anesthetized with isoflurane in oxygen via mask for abdominal radiographs and ultrasound. Right lateral and ventrodorsal radiographs were obtained (Fig. 1). A 6–7-cm soft tissue mass was present in the right caudoventral abdomen. The mass terminated abruptly at a region of fat opacity in the caudal abdomen. There was a step with a lack of continuity between the trigone of the bladder and the urethra. Sonographically there was a thick-walled, fluid-filled structure containing mobile echogenic material (Fig. 2). The fluid-filled structure did not appear contiguous with either the ureters or the urethra. A hyperechoic area was detected between the cystic structure and the urethra. The ureters appeared to course caudal to the cystic structure and the hyperechoic region and to enter near the suspected urethra. Bilaterally, there was moderate hydroureter and hydronephrosis (Fig. 3). A small amount of peritoneal effusion was present. The primary consideration for the cystic structure was urinary bladder as no other structure that could be consistent with a urinary bladder was found. However, the connection to the urethra was not defined. Other differentials included a fluid-filled uterine horn or lateral vagina.

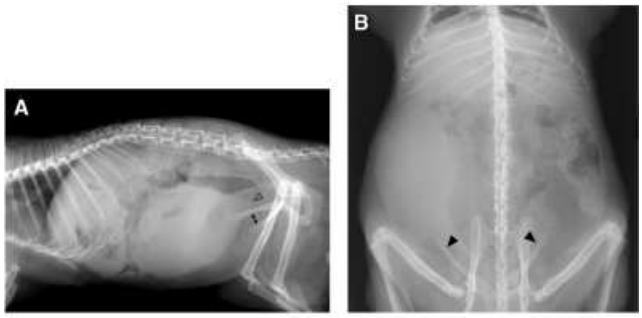

FIG. 1. Right lateral (A) and dorsoventral (B) radiographs of the abdomen. There is a large (6–7 cm) soft tissue mass in the right mid to caudoventral abdomen. There is a fat opacity caudal to the mass. The mass terminates abruptly in this region (open arrow). The epipubic bones, unique to marsupials and monotremes, are indicated with closed arrows.

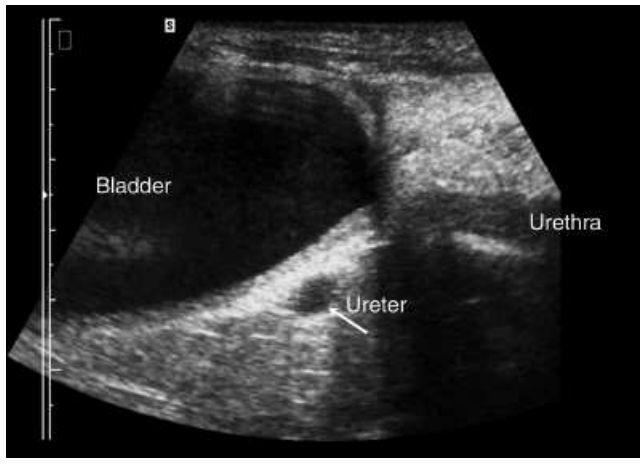

FIG. 3. Sonogram of the trigone region. The urinary bladder is distended. Both the observed ureter and the urethra are distended. There is a lack of continuity between the bladder and the urethra. An area of hyperechoic tissue is overlying this region.

Six milliliters of fluid aspirated from the cystic structure contained 500 nucleated cells/μl, 28 g/l protein, and a specific gravity of 1.021. The fluid was burgundy and serous. Cytologically, there were moderate numbers of degenerate neutrophils with or without intracellular bacterial cocci, extracellular cocci, and sloughed individual to small clusters of epithelial cells. Though suspected to be urine, creatinine levels were not measured on the aspirated fluid, therefore, it was not definitively identified ante-mortem. Euthanasia was elected.

At necropsy, there was 50 ml of clear yellow fluid within the peritoneal cavity. The urinary bladder cranial to the trigone was markedly distended and extended into the cranial abdomen with an apical omental adhesion present. The affected portion of the urinary bladder was transmurally dark red to black and thickened with a width of 3 mm compared to 1.5 mm for the unaffected urinary bladder. Three mm proximal to the trigone, the urinary bladder was enwrapped by three counterclockwise loops of the stalk of an intra-abdominal fat pad (Fig. 4). The lumen of the bladder was reduced at the point of the incarceration (0.5 cm diameter). The main bulk of the fat pad was firm and dark yellow on cut surface. Bilaterally, the ureters were dilated (circumference range of 0.5–1.0 cm) and the renal pelvis mildly dilated.

Representative sections of the urinary bladder, kidney, and intra-abdominal fat pad were fixed in 10% formalin, processed routinely, sectioned at 5 μm, and stained with hematoxylin and eosin. There was a transmural necrohemorrhagic cystitis with fibroplasia, vascular fibrinoid necrosis, and intravascular thromboses. Lymphocytes, plasma cells, and neutrophils extended through all layers

FIG. 2. Sonogram of the abdominal mass. The structure is fluid filled. Echogenic mobile material is suspended in the fluid and there is sediment in the dependant areas of the lumen. The structure has a thick wall (2.4–3 mm) with indistinct layers. There is an echogenic strand projecting into the lumen.

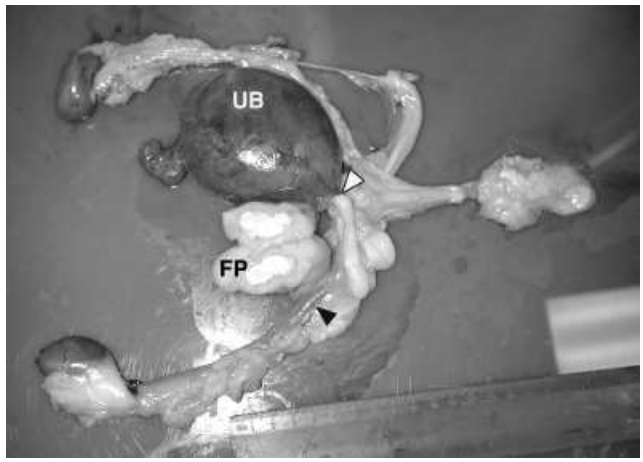

FIG. 4. The opossum's genito-urinary tract. The urinary bladder (UB) is hemorrhagic and distended with urine. The urinary bladder is incarcerated by a stalked intra-abdominal fat pad (FP) approximately 3 mm cranial to the trigone (open arrow). On sectioning, the fat pad had a necrotic center. The ureters are distended bilaterally (closed arrow).

of the urinary bladder, which was expanded by edema. Degenerate and viable neutrophils admixed with fibrin coated the serosal surface. The kidneys had scattered lymphocytes and plasma cells within the interstitium. Renal tubules were multifocally dilated, atrophied, and contained protein casts. The intra-abdominal fat pad was infarcted and composed of necrotic adipocytes and thrombosed vessels.

Discussion

Reports of urinary bladder obstruction and infarction by an intra-abdominal fat pad do not exist in other animal species. The pedunculated conformation of the intra-abdominal fat pad and the obese condition of this opossum may have predisposed to this lesion. An analogous finding would be that of pedunculated lipomas in horses leading to incarceration, vascular thromboses, and infarction of entrapped intestine.[4] In humans, infarction of the urinary bladder has been associated with an inguinal hernia and coronary artery surgery (e.g., intravascular thromboses).[5,6]

Stranguria was reported in this animal. A large portion of the urinary bladder was incarcerated; however, the urethral papillae were uninvolved and were caudal to the incarceration, allowing for urinary clearance. The dorsoventral collapse of the urinary bladder decreased urine outflow from the ureters, leading to hydroureter and mild hydronephrosis. Fibroplasia of the urinary bladder indicates a change of at least 2 weeks' duration.

A cystic structure was identified sonographically in the caudal abdomen of this opossum. Possible identities of this structure included urinary bladder, uterine horn, or lateral vagina. Lateral vaginae are structures unique to female marsupials. The two lateral vaginae fuse, forming a vaginal pouch dorsal to the urinary bladder.[7–9] These structures can initially be confused with uterine horns by those unfamiliar with marsupial reproductive anatomy. In this patient, while there was evidence of urinary bladder entrapment by the abdominal fat pad, the uterus and vagina were unaffected.

The decision to classify the structure incarcerating the bladder as a pedunculated fat pad and not a lipoma was based on the fact that the structure was located in a region where there is normally a fat pad in opossums. Thus, though abnormal in conformation and enlarged due to obesity, it cannot be classified as a true neoplasm.

Urinary bladder incarceration by an intra-abdominal fat pad is an unusual finding that should be considered as a cause for a caudal abdominal mass and urinary tract obstruction in opossums.

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